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The Czar of Russia inspecting one of his automobile hospital corps in the field trials. The Czar is indicated by the cross

Russia — An Opportunity

Czar's Empire Is Immense Market for American Cars —Government Favors Imports—Few Russian Cars

By the Late E. P. Batzell

[EDITOR'S NOTE.—*Owing to the fact that this article was prepared some time ago by Mr. Batzell, it must be taken as a description of conditions in Russia at the outbreak of the great European war. This war, however, has probably not greatly altered the complexion of affairs in this respect.*]

RUSSIA has immense opportunity in store for the general automobile business and other business lines more or less connected with it. The selling and maintenance of cars have the better outlook with them, from the view of profits, than the other activities in this field, notably that of manufacturing whole cars.

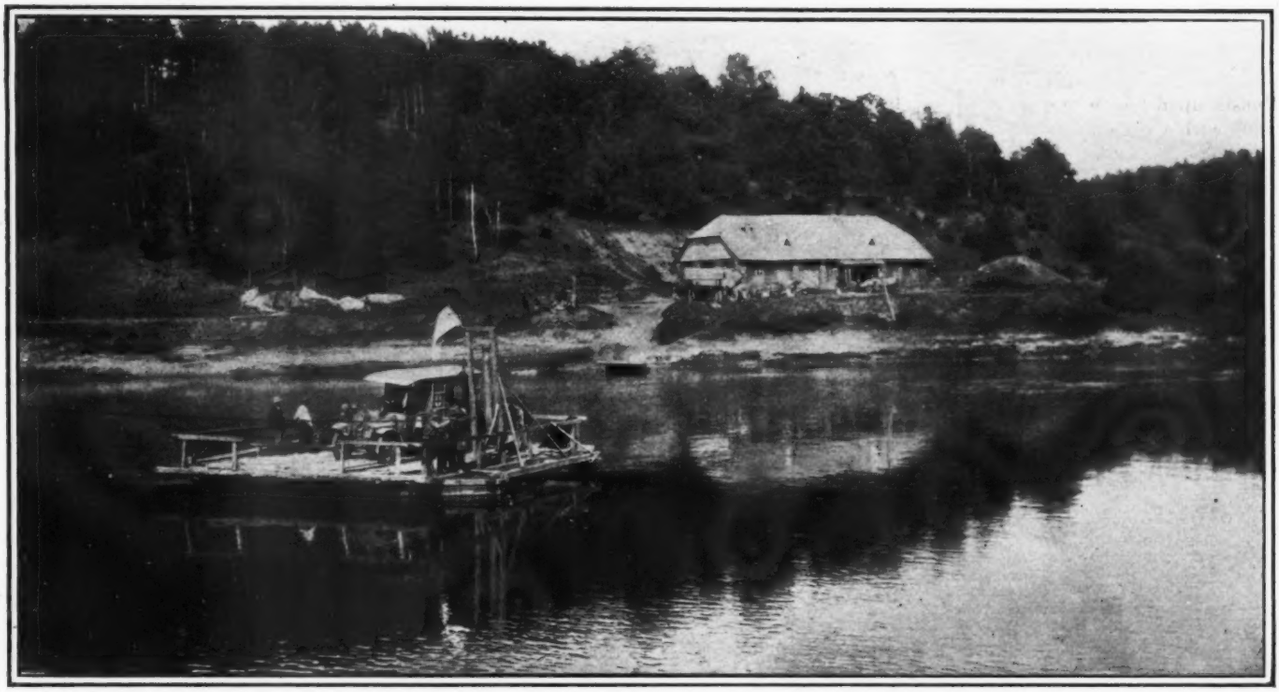
In Russia manufacture is far behind in ability to create strong competition for the imported product on account of the small quantity of cars which can be built with the available facilities. Although the number of establishments actively engaged in building cars is gradually increasing, certain European companies are beginning to open branch plants. Nevertheless it remains very doubtful that the home-built cars ever could form a large proportion of the number of automobiles annually absorbed.

Some very good cars have been and are being built, but only in small numbers of any specific type, each establishment in this line putting out so many different types that this in proportion to the total early output eliminates the possibility of economical quantity production.

The facilities of the factories apparently are directed to satisfy the varying requirements of prospective buyers by building cars for all tastes, almost on the to-order basis. Such a situation is characteristic of all Europe, but it becomes more apparent in Russia because the individual output of the Russian factories is very small, even in proportion to other European countries.

The condition of the general automobile market is to blame for this, because the parties at the head of the concerns fully realize the station occupied and are making efforts to change from their methods of building automobiles to suit the orders which they are apt to get regardless of the requirements in the latter. Instead of hunting buyers with every possible taste, they are endeavoring to concentrate their efforts upon a few models manufactured as economically as possible, for which they may have only certain classes of buyers.

The biggest automobile factory in Russia is the Russo-Baltic. Reducing its number of models and increasing production on a manufacturing principle, this factory expects



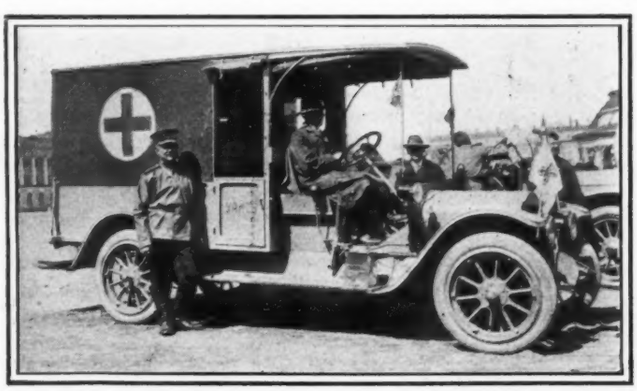
Ferrying one of the White Red Cross ambulances across a river in the Russian army trials

to bring its output from 300 to 1,000 cars per annum. It is well provided to enable it to put through its intentions, as it increases and betters its equipment constantly. It produces good cars, not inferior to the European standard of quality, and has a good reputation. It needs a real sales organization, however. This factory stands on a good road to economical, strictly quantity production, but the influence of the Russian government on a concern so well specialized in this line as the Russo-Baltic is will never allow that. Government orders and subsidies cannot be refused and, on the contrary, they must be solicited, which generally means that the factory must do a large amount of special work in its various departments, thus interfering with the correctly planned production of the regular articles. The situation increases the cost of these regular models, but there are many profits connected with it which more than offset that, really leaving the manufacturer to look upon a government order as a highly profitable business.

Government a Big Buyer

The Russian government is to be considered the biggest individual buyer of automobiles in prospect for the near future and for a long time to come. It is gradually acquiring passenger and commercial vehicles for all kinds of service, and it is also a large prospect for such allied products to the automobile industry as motors for aeronautics, for marine purposes, etc. No doubt so well equipped an automobile factory as the Russo-Baltic will enter similar branch fields sooner or later. The government might offer assistance and subsidies for this purpose, as an inducement for the factory to take up allied lines, the need of which is in view. Naturally, subsidies will be offered on the production of vehicles of special character, for military or civil purposes, together with a high purchase price for them.

Those are reasons why a big factory generally in Europe, and particularly in Russia, cannot develop strictly by its own tendency, but falls under the influence of certain factors foreign to it, chiefly in the form of the country's government.



White ambulance of the hospital corps as it started in the trials

Cars Are Well Built

Such outside influence interferes with the regular manufacturing of articles in quantity, but, on the other hand, the interconnected considerations of business character make one accept it. As mentioned, notwithstanding the harm done in some particulars, there are large profits attached to such orders, both in a direct and indirect way. Executing orders for the government has a big all-around trade value, not merely as an advertisement assisting sales to private parties. At the same time it interferes with the proper development of the regular automobile specialty in the factory, making it more difficult for the latter to catch up with its competitors, especially as long as there is but a slight duty on the imported product.

The Russian-built car was said to be the equal of the up-to-date European, or, rather, of the German-French types. This refers to the construction, the luxury, appearance, etc., whereas they are somewhat cheaper in price and at the same time they are better adapted to the prevailing road conditions in Russia.

They are not so fast as the European cars in general, perhaps on account of their greater weight or lower gear ratio, which is the more probable, as they leave nothing to be desired in regard to pulling ability. It is notable how some duly-recorded performances have been made with cars weighing a great deal more in proportion to

the average for that type and motor power. Taking into consideration that at the present there is no road in Russia upon which one could drive with a very large factor of safety at over 50 miles per hour, higher speed being possible only on streets or on special tracks, the present Russian car can give complete satisfaction with all the service reasonably to be expected from it.

White tank wagon as it arrived at Koona in the Russian army trials

Referring to the materials entering into the construction of cars, all the better grades of steel used for the more important parts can be obtained only by importing them.

There is hardly a foundry in Russia which would commercially produce complicated castings like those for the cylinders. But in this respect it is not difficult to catch up with the rest of the world, because there are some very good foundries which thus far have specialized on large parts only, but which could be doing good work for automobile purposes after devoting some little effort to it. Apparently this was unnecessary, as the limited number of cars built could be furnished with many imported rough or finished parts, the available quantity being too small for warranting the creation of a special home industry. This covers merely iron or steel castings, as brass and aluminum are readily obtained there.

Good pressed steel parts and drop forgings are imported, principally on account of the material employed for them, but minor parts of the same kind and inferior material are made at home, sometimes using foreign material.

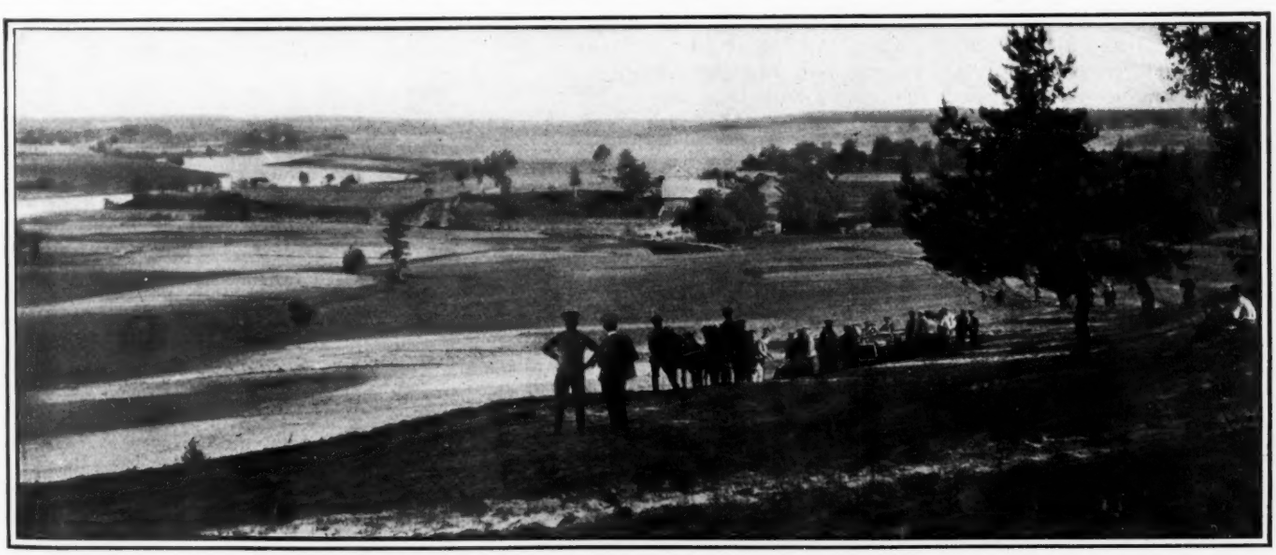
All the finer accessories are naturally obtained in France and partly in Germany. The motor car bodies are very well executed in Russia, equally to the high-grade European standards of quality and style, better than the European work of minor grade. The coach building art generally is well advanced in Russia, but lack of facilities and initiative have interfered with its taking a merited standing in the world's market.

The building of cars is largely done with the help of experienced workingmen imported from other countries. This importation of foreign help is being gradually reduced, approaching that state when there are but a few experts of West European training in each department for the work really requiring specialists. The rest are native workmen. One is practically forced to get capable workmen from outside of the country in the event of an increase of production at the plant, as the available native resources are far from adequate to fulfill the need for experienced help created with any such considerable change from the normally established state of affairs. This is self-evident, when one considers the few automobile concerns which could educate and furnish a reserve of proper help for future needs. Moreover, the number of workingmen employed in any plant is kept much more steady the year around than in the United States, as one does not lay off so frequently as here. Consequently there is much less shifting around and going from one concern to another, leaving hardly anybody to select from when a specialized concern, like the one building automobiles in Russia, suddenly finds itself short in expert help.

Government Encourages Importation

Conditions similar to the related ones are largely responsible in preventing the Russian automobile industry from gaining a good standing in relation to the importation of automobiles. However, the existing policy of the government is to further with great efforts the introduction into the country of the automobile in general without connecting that with protection of this home industry at the same time, which may be expected only at later date when Russia becomes more independent and more supplied with this needed article. Until then the home industry will have to show itself capable to take care in a responsible manner of a great portion of the yearly requirements for automobiles of the various types. Judging from the present standing of this industry and from its prospective development in the near future nothing like the above can be reasonably expected parallel with the growing development of the importation of cars, and thus Russia is left as a great field for the disposal of all kinds of automobiles from the whole world without fear of home competition.

The truth of this prospect is hardly to be doubted, but the



Dragging one of the cars in the Russian army trials up a hill. Note the absence of roads

One of the luncheon stops during the field trials of the Russian army automobiles

rate at which the Russian automobile market will develop in the near future is governed by many circumstances, some of which can be foreseen and some of which can not. The Russian government is a large and steady buyer with great requirements for different passenger, commercial and special types of cars, although the quantities of these purchases grow only gradually, leaving time to get familiar and to try out the bought product. Nevertheless the private public as individuals or as corporations will absorb by far the largest number of vehicles, and it really represents the most attractive side to do business with pursuing merely the object of direct and quick profits.

Interest Is Growing in Automobiling

In Russia the automobile owners, the prospective buyers and the general public are occupying the stage at present, as was characteristic of the United States a few years ago, say 6 or 7. They all are very much interested in automobiles and automobiling; that is, their attention is easily directed toward the latter, but only in a superficial way. At the time quoted here in the United States there were a great many parties who are automobile owners now and who under the circumstances of that time did not think that such a thing could possibly take place because they thought they could not afford a car although they would have liked very much to be able to do so. Gradually people with much smaller means started to buy cars than bought them a few years ago.

Similarly, there is a very large class of Russian medium rich and rich people who are fond of automobiling, but who do not deem themselves to be able to afford to own a car. They take a ride occasionally in a friend's car or in a hired one. They keep in touch lightly with the automobile field by glancing over magazines, etc., but at the same time they do not care to go into a study of technical or commercial details of the cars and of their use, because they cannot assimilate the thought that a large number of them really will buy and use automobiles within the next few years.

All over the world the first stages of the advent of automobiles were connected with abuse of the early and inexperienced automobile owners, especially in regard to their money. It has taken years to educate the American public at large so far that it cannot be cheated easily, that it possesses a certain ability to personally judge more or less correctly things in connection with the upkeep and repair of an automobile. The pleasures of automobiling are enjoyed without the necessity for the continuous services and advice of chauffeurs and other experts. Such ability largely to take care of one's own needs in connection with automobiles has to be looked upon as the prime factor which facilitates the present widespread use of the automobiles in various lines of life and business in the United States. The same factor based on existing conditions in Russia and on the possible progress of the near future cannot promote such a rapid progress there as is witnessed here because the level of public progress in the matters of automobile use and utility is much lower and advances but slowly. This progress is, however, not far behind the western European, the governing conditions being very much alike in all countries there. As yet it is impossible to look upon an automobile otherwise than as an article for the amusement of the richest classes, because the owner is obliged to keep a chauffeur, pay high rates for any repair work or general maintenance and at the same time he has such a slight understanding of all matters pertaining to the keeping and running of his car that any dishonesty he is apt to meet with in this connection is bound to triumph over him.

Maintenance Is High

Even with the low rates for help in Europe, the yearly expenses arising with the maintenance of cars in good order, with the chauffeur and with an average amount of driving, are liable to reach one-half or more of the original purchase price of the car.

Education in automobile matters is what the public interested in them needs the most to become real enthusiasts. A short term of automobile ownership ought to suffice to make the owner so far advanced and proficient that the chauffeur would be reduced from his standing of authoritative expert to merely a servant for driving the car, hauling it around to the house and doing the rest of the common work required. That refers to families who keep but one car, whereas those who can afford to have a number of them of course can have chauffeurs as distinctively specialized as they are now. As a rule, the enthusiastic Russian automobile owners do not hesitate to do some work on the car themselves and, in fact, they know how to see pleasure in this work at times. It is the consciousness of one's incompetence

which makes a suffering party out of the average car owner, the more so as they are apparently not trying hard enough to acquire the necessary knowledge.

Owners Must Employ Chauffeurs

It was mentioned that the owners of cars *must* employ chauffeurs, which circumstance somewhat aggravates that situation and interferes with a gradual elimination of it. The chauffeur is as much a necessity there when one has a car as a servant is for the household, however small the latter.

In Russia every city family has at least one servant, even the poorly provided ones, as it is utterly impossible for decent families to get along without them. Naturally then, having a chauffeur to rely upon, should anything happen to the car or should one run across any emergency, the car owner himself is not pressed to gain knowledge and experience so long as he stands all the costs submitted. A novice motorist is especially under the influence of his chauffeur, which prompts the latter to derive some personal benefits, although not always without causing a loss to his employer at the same time. One considers often the chauffeur's advice when selecting a car to be purchased; he buys the materials needed for the car, etc. The owner is left to some extent at his mercy, and certainly the conviction that this is the inevitable state of affairs spreads among the ranks of the would-be automobile buyers who become scared away from the idea of owning a machine which would have to serve particularly well to the benefit of some one else and not for theirs.

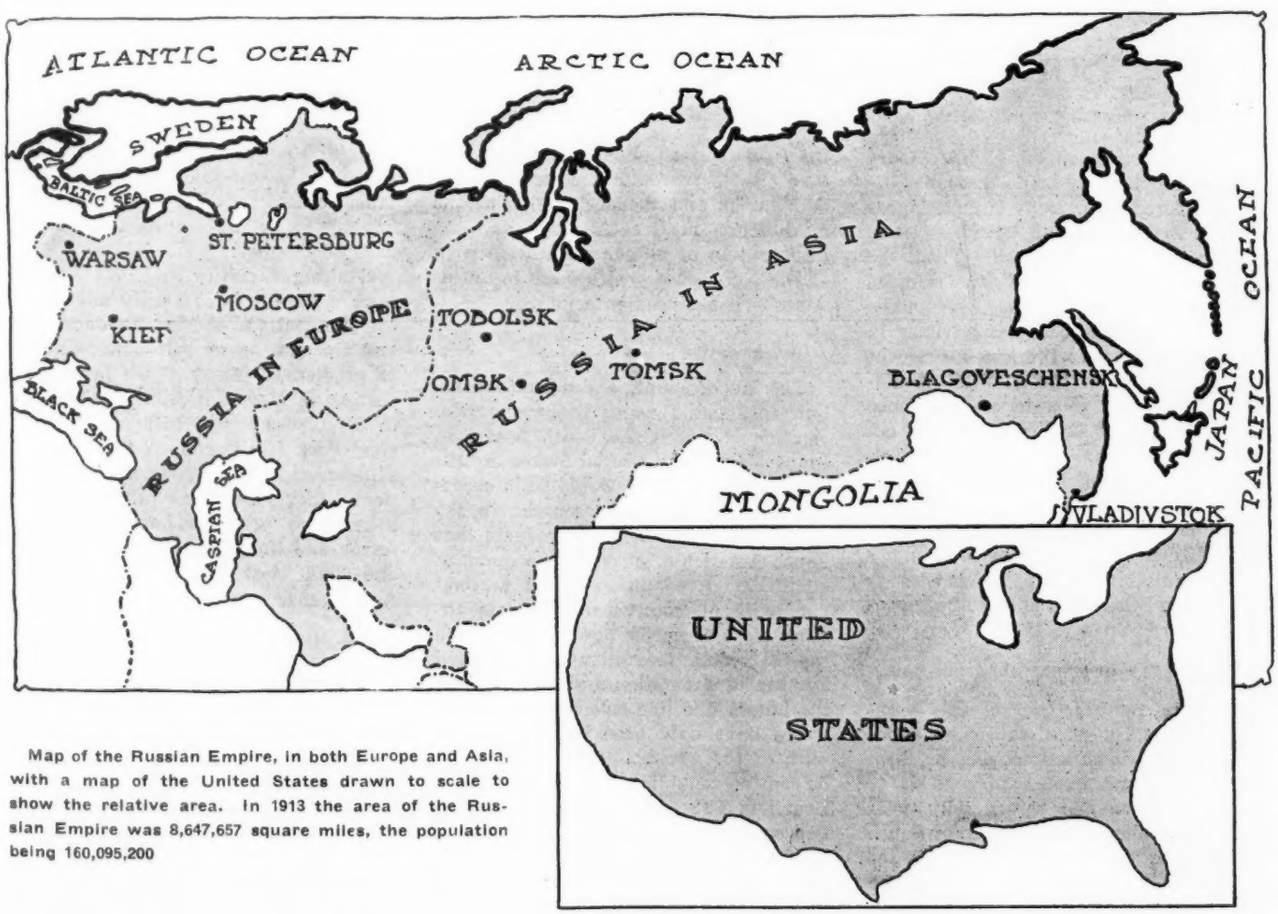
Easy Cheating Anticipated

The writer feels correct in stating, that at present there would have been many more automobiles owned by private parties in Russia for their personal use, if there would be no prospect of easily possible cheating anticipated. Many would have preferred to pay big prices for work and materials really honestly worth it, than to spend less and still be a recipient of articles not up to the value paid for. Similarly, one would rather have an expensive but honest chauffeur, than one with a smaller salary, who will look for compensation on the side. Consequently it seems that to increase the volume of the Russian automobile market, first of all one should lift the standard of the public knowledge and understanding of that field, so as to enable it to handle the whole matter with intelligence. Only then will a great part of the public expect and derive real pleasure from motoring and understand the commercial advantage of cars in many lines of their possible application. One would be free from the conviction, that when going on a trip it is necessary to be prepared to pay a sum largely left to someone else to determine, whereby you are unable to judge anything about this amount. This is almost like letting a man help himself from one's pocket in that the amount he receives depends only on his courteousness.

Dealer Furnishes Chauffeur

It is a correct policy, as adopted by some automobile selling houses, to furnish the chauffeur at least for a certain time to their customers, until the latter become more or less familiar with their machine so that they cannot blame the agents should anything sudden happen, which a new customer would easily look upon as caused by a defect of the machine, whereas it may be not that but the inexpert handling. No doubt that a guarantee covering the maximum rate of cost of upkeep would be very attractive to customers, if such a guarantee could be realized properly, without harming the business of the dealer.

(*To be continued*)



Map of the Russian Empire, in both Europe and Asia, with a map of the United States drawn to scale to show the relative area. In 1913 the area of the Russian Empire was 8,647,657 square miles, the population being 160,095,200

War Stagnates European Trade

Only Buyers Are War Departments and Only Demand Is for Trucks—Most Factories Are Closed—Hostilities Began in Slack Season

By Special Cable from J. S. Critchley

President of the Institution of Automobile Engineers

LONDON, Eng., Aug. 17—Special Cable—Trade in automobiles, except in vehicles for war purposes, is completely stagnant. It is impossible to state whether the Continental factories are actually doing work, but it is known that very many are closed due to being in the war area or all the labor being drawn to the army. The F N works at Liege, Belgium, are closed, while all the other works in that area, makers of pleasure cars, are simply doing as little as possible and it is doubtful if any progress will be attempted in connection with next season's models. It seems that the war has come at the time when trade is always slack and no attempt will be made to get in supplies until the outlook is more settled. No component parts can be brought into this country from the countries at war, but this only affects the makers of commercial vehicles which are of course in demand. Supplies of most parts can, however, be supplied by the British firms with the exception of cast sheet wheels and magnetos.

To sum up the situation, the only purchasers of automobiles are the various war departments. Most of the purchases are in heavy vehicles. Therefore other makers are practically closing down and not troubling about the supplies. There is a demand only for commercial vehicles to replace those taken for war purposes. All the stocks are depleted and the outputs have been sold for long periods ahead.—J. SIDNEY CRITCHLEY.

South America the Golden Opportunity

By J. Edward Schipper

NEVER was an opportunity more propitiously made than that offered by present circumstances for the development of American trade throughout South America. First, the fair-minded attitude of the United States toward the neighboring republic of Mexico during the trying times in the latter, and the willingness to accept the good offices of the A. B. C. mediators established a state of confidence in the people of this country to a degree higher than ever existed. Following this establishment of confidence there comes the European war which at a single stroke severs the huge southern continent from the source of many of its manufactured supplies and leaves the United States as the logical alternative toward which to turn.

Finance Affected

But the manufacturer of this country cannot fill a vessel full of his product, whether it be automobiles or farm machinery, and expect to send it to South America and return with solid cash. The blow to the finance of South America by the European war was too severe for an instant recovery and the time is not ripe for quick cash deals in those countries. South America has been clearing through English and German banks and the declaration of the moratorium in Great Britain and the interruption of all communication with Berlin has been a severe check to Latin-America's business enterprises.

A Brisk Gain

The law of supply and demand alone, however, would cause the commercial relations between the South American countries and the United States to take on a briskness which would be in excess of anything that has occurred in the past. There are certain products that South America must receive in constant quantities, a condition which is common with all countries. There is another class of goods, however, in which the trade must be built up and fostered by careful promotion and to this class the automobile line belongs.

We have only been getting 10 per cent. of the automobile business in the Argentine republic. Our percentage in Brazil is but little better. Yet these two countries are heavy purchasers of cars and the field is hardly touched. It is also a marked fact that the cars purchased have been of fairly high price and not the cheaper variety, showing that the low-priced car field, which must necessarily exist in every country, has not as yet been opened up to even a small degree.

Banking facilities in South America have naturally been keenly affected by the shock of the sudden European war and the results of this cannot as yet be predicted. Many of the largest exporters in New York City believe that in the future it will be a race between New York and London for the banking supremacy in Latin-America. The National City bank has already established two branches, one in Buenos Ayres and the other in Rio de Janeiro and has opened a complete South American department.

Big Business Soon

There is a strong feeling in the minds of many who have made a study of conditions in South America that the time will not be ripe for big business until the financial atmosphere has had time to clear and that this will take from 2 to 3 months. The American Trade Tour Co. which had chartered the steamship *Kroonland* with the idea of making a special voyage to

South American ports for the purpose of exhibiting and introducing American goods into these countries has become firmly convinced that the original date of sailing, October 14, would find the new territory unprepared for the commercial invasion and has postponed the sailing of the vessel until after the first of the year.

Thus, while the market is there beyond a doubt, still it is a market that must be developed. Credit will have to be given and counter-products bought in this country to give a firm basis of trade. The opportunity is golden but it is a market which must not be rushed but carefully nurtured.

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U. S. Has Advantage in South America

NEW YORK CITY, Aug. 12—American automobile manufacturers now have the advantage over the European makers in respect to the South American trade. The United States has the chance of its history to dominate in the exportations to the lower continent. Honesty is necessary in all negotiations as there have been evidences of highly developed "Yankee thrift" and "get-rich-quick" sales methods in the past and the Latin Americans are now suspicious of some of the products from the United States.

Argentine Consulate Talks

These points were accentuated in an interview given to a representative of THE AUTOMOBILE today by Ricardo C. Tort, chancellor of the Consulate General of the Argentine Republic.

Said Senor Tort:

"In 1912 the total imports of automobiles in Argentina were 4,281 cars, of which 1,651 were bought from France, 708 from the United States, 627 from Germany, 451 from England, 422 from Italy and 295 from Belgium.

"Since then the imports have increased as financial conditions have improved. The war is a heavy strain on the country now, of course, and it has been necessary to declare a moratarium. Still Argentina is no worse off than other countries.

Profits Were Exorbitant

"It is probable that American imports, prior to the war, were not increasing so satisfactorily inasmuch as a bad feeling was developing toward American cars.

"Cars that sell for $1,000 and under with all equipment in the United States were priced at $2,500 and $3,000 without equipment in Argentina. This is not due to the heavy cost of shipment, which is light. And the duty is only 10 per cent.

"As soon as the Argentine people found out that they were paying the same price for cheap American cars as was quoted them for Panhard-Levasseurs and Isotta-Frischinis and Mercedes, naturally they would not buy the American cars so readily.

Argentine Not Mechanical

"The Argentine people are not mechanically inclined in the slightest degree. Therefore, all have chauffeurs to whom the operation and maintenance of the cars are exclusively left. Practically all of these chauffeurs are Germans, French and Italians, the last two principally. It is natural that when an owner leaves the purchase of a car to his chauffeur, the chauffeur will prefer to buy a car from his own country.

"A further consideration is the fact that practically all of the foreign manufactories keep large stocks of repair parts in Argentina and there is no delay in obtaining supplies. Most of the American makers keep no such supplies and, therefore, when a part breaks there is a delay of months until the part is obtained from the United States.

Chauffeurs' Salaries

"An average chauffeur in Argentina is paid from 200 to 250 pesos a month —from $100 to $125. There are some that get more, and many less. All of them make extras as they take advantage of the mechanical ignorance of their employers and take every chance to have the cars sent to the repair shops, from which they receive tips.

"Because of the revelations that prices for American cars are out of reason and that cheap cars—that seem just as shiny and complete to an Argentine man as the expensive European cars—are being unloaded on them as good grades, the American cars have become somewhat of a joke. They call them 'coffee pots.'

"Out of the 1,651 cars imported into Argentine from France in 1912, I guess that 1,200 of them are Panhard-Levassors. All of them probably are giving good service and their popularity is growing.

America's Chances Good

"The American automobile makers can sell good cars in Argentine. There also is a market for the medium and cheap priced cars, if they advertise them honestly. I don't know if there will be any heavy buying for awhile. I imagine that the people will be conservative with their investments for the time being.

"But the present condition cannot help but profit the American manufacturers."

Willys Sees Big Trade Opportunity

TOLEDO, O., Aug. 14—The European war will act as a positive boost to American business in general and the automobile industry in particular, in the opinion of John N. Willys, president of the Willys-Overland Co. and second largest manufacturer of automobiles in the world, who expresses his views in a cablegram from London, Eng. For 2 months Mr. Willys has been making a study of conditions in Europe at close range and is thoroughly in touch with the situation:

"The English are not slow to see the great opportunities for trade extension given to the United States by recent events," writes Mr. Willys. "Sir George Parish, England's foremost financial writer, declares that the war will bring great wealth to American industries and an economic benefit to the people of the United States.

"The call for army reserves throughout Europe has completely demoralized the industries on this side of the Atlantic. Many of the largest automobile factories have practically been unmanned. Only a very small number of automobiles will be built in Europe until there is a cessation of hostilities.

"In the meanwhile the entire field will be open to the American motor car manufacturers. There may be some difficulty in shipping cars to European ports as they may be declared contraband goods, but the rest of the civilized world will be free from European competition and is America's for the taking. And once the people who have heretofore bought automobiles of foreign manufacture discover the superiority of American cars, Europe will never regain the field she has lost."

Joy Sends "Cheer Up" Telegram Broadcast

DETROIT, MICH., Aug. 14—President Henry B. Joy, of the Packard Motor Car Co., who was appointed a director in the Federal Reserve Bank, of Chicago, is confident that notwithstanding the European war and the momentary disturbance this condition caused throughout the United States, the future looks bright here in America and that there is no need of worry as to business. As an evidence of his conviction in the matter President Joy sent the following telegram to every Packard dealer in the United States:

"Business and banking conditions improved wonderfully since Wednesday. Reported normal again here by Detroit bankers. We feel no apprehension as to future business conditions. The war scare is largely over. International ocean traffic will be improved daily. Nations which have been consumers of Europe's vast exports must now naturally become patrons of America. Post this on your bulletin board."

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LONDON, ENG., Aug. 17—The war department of Austria has bought all the tires from the Goodyear stock in Vienna, according to the London manager.

The Transcontinental Saxon's Trip

Far from a Joy Ride—Lincoln Highway Progress Remarkable, But Roads Are Still Poor in Many Sections

By M. A. Croker and Fred Wilkins
Pilots of the Coast-to-Coast Saxon

ANYONE who thinks of the Lincoln Highway as a finely-paved road stretching from one edge of the nation to the other and offering ideal conditions for touring all the way, has a mistaken impression.

Some day driving over it from coast to coast will be in the nature of a joy ride. The wonders that have been wrought by its sponsors indicate that. But great roads are not built in a day or a month or a year. Considering the comparatively brief time since the Highway was first projected, the progress has been truly remarkable.

By next year even more mighty things will be accomplished, and it is our opinion that fully 2,500 motorists will journey to the Exposition on the coast by motor car instead of using the railroad as many of them undoubtedly would do but for the Lincoln Highway.

At the same time, as we stated at the outset, to cross the continent over the Lincoln Highway in its present state is far from being a joy ride, and we ought to know, for we made the trip in a Saxon car, setting out from New York on June 4 and arriving in San Francisco on July 4. This car was the first ever to go the full distance of the Highway on a continuous trip and the first small car ever to cross the continent over any road whatever.

In our opinion this trip did much to show the progress that has been made in the art of building automobiles. It showed that the transcontinental journey is not for large or even medium sized cars alone, but is possible easily for light cars. It serves to correct an impression that the small car is practical only for city driving. For, as will be seen from the experiences we met with, a small car may not only get over boulevarded roads, but may climb the steepest hills, plow through the deepest mud and sand and go over the roughest roads—often even better than large cars. This is interesting incidentally from the fact that we all recall how only a few years ago, even owners of the heaviest cars would hardly have dared to attempt such an arduous journey as this.

It is worthy of mention, too, that the Saxon which made this trip was not a new car, but the same vehicle which previously ran 135 miles a day in a test lasting 30 days. This test—4,050 miles—was equivalent to the service a car gets in a year in the hands of the average car owner.

Lincoln Highway Saxon amid picturesque surroundings in Western Illinois near the Mississippi

The Lincoln Highway when completed will be 3,389 miles long. Detours, however, due to repairs on the road, washouts and several trips off the main route and back again at the request of dealers who planned receptions—these brought our total mileage up to 3,873 miles. We were on the road 30 days, the actual running time was 278 hours, and the average distance was 129.1 miles a day. The highest day's run was 186 miles. The car showed unusual economy, averaging 30 miles to the gallon of gasoline.

We found interest in the Lincoln Highway and in this run at a high pitch all along the way. Motorists were convinced that this way, when completed, is going to be a boon to humanity. At many towns escort parties came out to meet us and then chased back ahead of us to tell the people in their communities the car was coming.

Road Well Marked

As for the Lincoln Highway marking it was excellent along the road, but we found some difficulty at times getting out of the larger cities because there was no way of telling which road would put us on the Highway. To add to our difficulties we were forced to contend with many road boosting enthusiasts who sought to have us use the roads they were boosting in preference to the Lincoln Highway.

With further reference to the excellent Lincoln Highway marking, even in the sparsely populated regions of the far west where one meets with no signs of habitation, the Lincoln Highway Association has marked the road by means of small pipes stuck in the ground at the side of the road.

Hotel accommodations are far improved over what they have been. The hotels everywhere appeared anxious for the trade of automobilists, many of them having garages in connection. They were always ready to give the best of service—in contrast to their apathy toward motorists only a few years back.

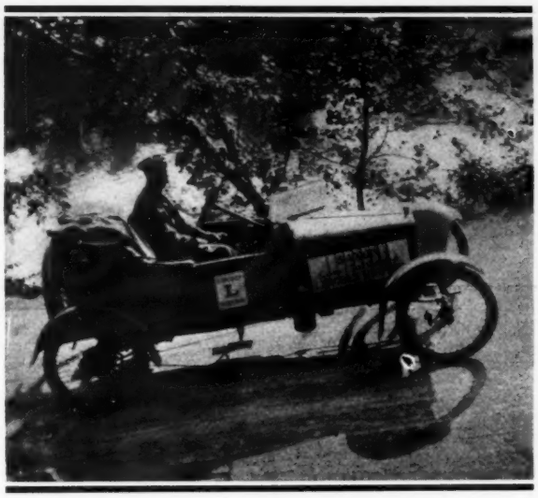
Details of the Trip

When we started from New York for the coast on June 4th, after dipping the rear wheels of the Transcontinental Saxon in the waters of the Atlantic Ocean, we were, of course, confident that

the car would reach the Pacific on July 4th—on schedule time.

However, that does not mean that the 3,873 mile trip—that was the actual distance covered by the Saxon—was a pleasure jaunt all the way. No coast-to-coast run is. Neither does it mean that we were always certain of reaching our destination on time. For there is an element of uncertainty due to bad weather, washouts, cloudbursts, the making of new roads which necessitate detours, and all the other factors beyond control of a car or its drivers.

From the time we passed beyond the Alleghanies and easily negotiated all the long grades—many of them 10 per cent.—our confidence increased. For it was in the crossing of the Alleghanies that the car first proved its dependability by requiring not one additional drop of water in the radiator. It took every hill easily and surely.



The little Saxon climbing a steep grade in Iowa. Some of the stiffest climbs on the route were encountered in this locality

Then came the tests through the sands of Ohio and Indiana. These did not balk the coast-to-coast car, although in spots the roads would have stalled many a heavier car.

Really Bad Roads

It was west of Dixon, Illinois, that we began to realize what really bad roads meant. Here we ran into a rainstorm which lasted two days and transformed the roads into an almost indescribable condition. We had to contend with these roads all through western Illinois and eastern Iowa. Just plain mud would not have been so bad, but it was not just plain mud. It was gumbo, and only one who has actually driven through gumbo during or after a heavy rain can appreciate what it is, how it clings to the wheel like glue, is thrown in masses and packs in so thick between the wheels and fenders that it has to be shoveled out. All this is apart from the fact that in driving over such roads low speed has to be used constantly.

To add to the difficulties we struck a new graded road beyond Cedar Rapids, where the gumbo had been taken from the sides and piled up at the crown of the road. Thus, in order to keep on the road, there was no alternative except to drive right through these piles of gumbo which often came up above the front axle. Even at that, there was the danger at times of running into a ditch, particularly if an attempt was made to travel along on high because of the slippery surface of the rain-soaked roads.

In venturing beyond Cedar Rapids we ran across seven cars that were forced to turn back and two that were stuck in the mud. We had to go into a ditch to get by these cars. Beyond that we saw no signs of man, vehicle or beast on the roads, and 30 miles west of Cedar Rapids we, ourselves, became convinced, after the Saxon had gone farther through these awful conditions than any other vehicle, that the roads were impassable. It was then that we turned back and stayed in Cedar Rapids until the rain had abated. No one ventured out during this time.

Gumbo mud does not change back into a favorable road for touring in an instant. Consequently, when we sallied forth from Cedar Rapids the second time we had to continue over more bad roads into Boone, Iowa—roads that had been put in this condition by the rains and had not been packed down.

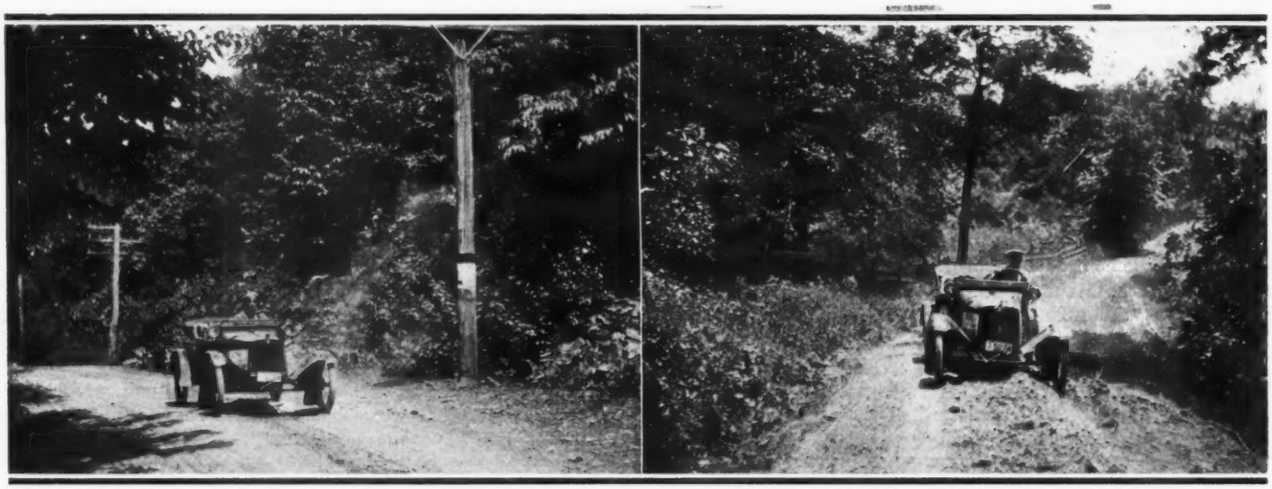
Here we started to hit the hills and we kept on finding it necessary to take hills frequently all the rest of the way to San Francisco.

At Omaha we met with a typically enthusiastic reception. The car was put in the show windows and attracted a lot of attention from passersby and those who went in to look at it.

In our run from Omaha to Grand Island—especially that section between Columbus, Nebraska, and G and Island—we encountered a cloudburst that washed out roads and had a similar effect on bridges. We found the Wood River swollen. The conditions we experienced may be imagined when it is added that the Lincoln Highway is crossed by the Wood River seventeen times. At one point things were so bad there was nothing to do but make a detour in order to progress.

From Grand Island to Gothenburg we struck fairly good

Right—Rough going in Western Nebraska. Some of the Nebraska roads are very good, though most of these are in the eastern part of the state. Left—The washout illustrated was encountered by the coast-to-coast Saxon on the road near Gibbons, Ia. It was the result of 2 days' continuous rain



Left—The Transcontinental Saxon among the hills near Council Bluffs, Ia. Right—A bad spot near Clinton, Ia., through which the Lincoln Highway Saxon pulled in its transcontinental run

roads until another detour was necessitated because of floods caused by the North Platte River and by the work being done in other vicinities in grading the roads. At Gibbons, Neb., the car made its way through roads that were veritable rivers, the water coming up to the radiator.

Beyond this point weather conditions changed. So did road conditions, but we cannot say that they were improved. Running into North Platte we encountered 22 miles of solid sand through which the Saxon blazed a trail—where there were no roads and where the only guide was a railroad track by the side of which we drove.

At Kearney, Neb. we passed a famous half-way post. It had required but 12 days of running time with an average of 10 hours each day to reach this point.

A By-Trip to Denver

Guided by nothing but wagon tracks, we drove from Grand Island to Cheyenne, where we arrived the next day at noon. A great reception was awaiting in Denver so we ran over there, a distance of 110 miles, which was made in 5 1-2 hours through the rain. From there, we retraced our steps back to Cheyenne and continued westward through Wyoming to Laramie and Wamsutter.

Going through Wyoming in one respect at least is like traveling across gumbo roads in Iowa. That is to say, one has actually to make the journey in order to appreciate fully just what the conditions are. The roads, so-called, are simply a succession of deep ruts with high centers, with the frequent occurrence of steep-sided gulleys. To cross these gulleys it is necessary to get a good running start, for the climb out of each gulley is made with the car in an almost vertical position. We found the state of Wyoming the least improved as to roads of any of the states we went through. It is going to be a big job to transform these primitive roads into good nes.

From Laramie to Elk Mountain, a distance of 86 miles, we opened and closed twenty-one gates on ranches through which we passed. There were no roads through this stretch. The steepest mountain climb up to this point was encountered near Elk Mountain. This summit rises to an elevation of 8,247 feet.

We had our first taste of desert country after leaving the town of Granger, Wyoming, which is on the edge of the Red Desert. Here the only excuse for a road was an old abandoned railroad grade which was extremely rocky and rough. By 2 o'clock in the afternoon, however, we had reached Evanston, Wyo., a distance of 127 miles, and just beyond this point we crossed the line into Utah, reaching Salt Lake City over more rough roads by way of Echo and Parley Canyon.

Some day perhaps this part of the country may be traversed without running into forbidding weather and road conditions. Up to now, however, it seems that each year the oldest residents rise up and state that never before in their memory have there been such cloudbursts, etc.

Slippery Alkali Mud

Naturally, we were not surprised that it had fallen to our lot to meet with adverse conditions. Just out of Salt Lake City we got acquainted with one of the worst rainstorms within the memory of man and were warned not to attempt to cross the Salt Lake desert at that time or within 24 hours after. We soon understood why this warning had been handed to us. For it was here that we got to learn what it means for any tourist to try and negotiate alkali mud during or just after a storm. This stuff is much different from gumbo, but we cannot say that it is any more welcome. It does not cling to the wheels and wrap itself around as gumbo does, but in another way it makes the going just as difficult. It is almost impossible to get traction in alkali mud. This stuff presents a shifting bottom. The car seems never able to get its wheels firmly planted.

After alkali mud becomes dry and hard it makes the best kind of a road, just as it is the worst kind of a road during or just after a rainstorm.

The elements continued to be against us, despite the fact that the alkali roads when dried were fairly good. The sun's rays now began to beat down and our trip across the desert was made with the thermometer from 120 to 130 degrees all the time. Generally there was not a breath of air stirring and when a wind did spring up it was one of those hot desert breezes that are just as bad as none at all. We must confess that we, the drivers, envied the car its ability to keep cool under these conditions. Every time we examined the radiator we found it not heated, even in the face of the trials placed upon it. Not once did we run out of water for the radiator, though at times we were 100 to 150 miles from habitation. As for gasoline, we always found the tank well enough filled to run from one supply station to another, despite the fact that these were often far separated. No reserve supply of gasoline was carried.

The Lincoln Highway skirts around the southern end of Salt Lake, which is on the edge of the Great Salt Lake desert. It also passes around several mountains. We made our way from Salt Lake City to Kanaka ranch, thence for 78 miles through the wilderness to Kearney's ranch.

From here we struck out for Eureka, Nev., a distance of 115 miles, where we checked in at 5 o'clock in the afternoon. We found the roads good between Ibapal and Eureka, but

from Eureka on to Austin we had to cross Shelburn Pass, one of the highest summits in Nevada. Not only does Shelburn Pass provide a real test for the mountain-climbing ability of any car, but it is rocky in addition and consequently tries out thoroughly the frame, springs, axles, and other parts. This condition continued nearly all the way into Austin.

Turning Road Builders

Next we came face to face with the fact that getting a car from coast to coast involves more than the simple function of driving. The added duty of blazing a trail—of turning road builders—was forced upon us. For it was often necessary for us to climb out of the car and remove boulders of various sizes that otherwise would impede progress. Everybody who goes over this course has to do the very same thing, because boulders are always being tumbled down from the mountain sides.

Of all the summits in Nevada, the New Pass Mountain near Austin is considered the most difficult. This is a newly discovered mountain and to ascend it requires a 9-mile steady uphill climb, with the grade ranging between 10 and 24 per cent.—never less than 10 per cent. In crossing from one foothill to another we frequently came upon gullies that had once been river beds and since were dried up.

It was through this region that we came across a man who subsequently became a dealer. He had been figuring on handling our car, and upon hearing that the coast-to-coast machine was headed his way, he determined to see whether it could negotiate New Pass Mountain before closing the deal that was pending. The car performed the feat and the contract was closed.

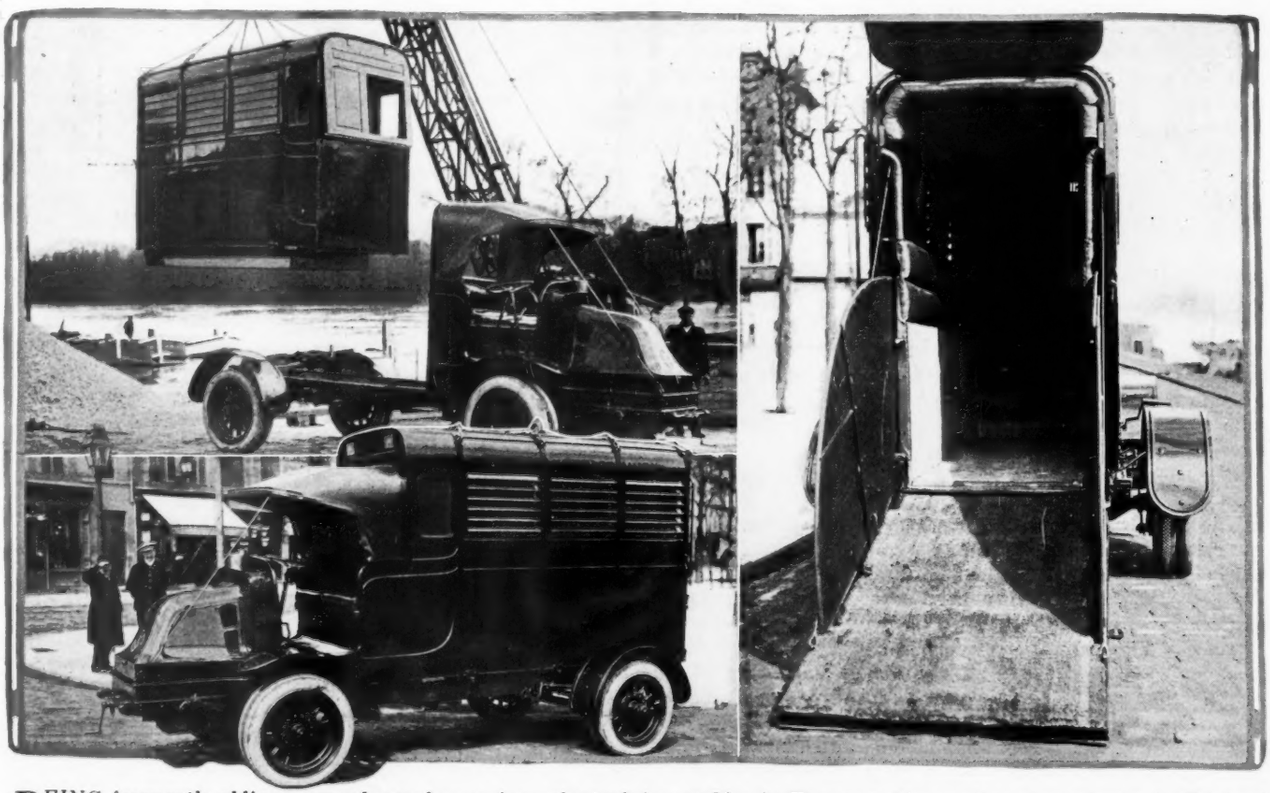
Two routes lead from Reno to Sacramento. The north route by way of the Truckee dam being closed to traffic because of snow slides, we went by the Southern route which led through Carson City and Placerville. After leaving Carson City we passed into King's Canyon, where there loomed up before us a summit of 6,940 feet—a continuous grade 6 1-2 miles in length with beautiful Lake Tahoe at the top. This was followed shortly after by the crossing of the Great Divide near Sacramento, and another sharp climb of 5,000 feet in four and one-half miles.

On the Home Stretch

We were now on the last leg of our 3,873 mile trip. But our troubles were not entirely over. For to offset the pleasure of driving through wonderful California we had to contend with the possibility of disaster, from the fact that we traveled many a mile at perilous, dizzy heights with only from one to three feet of road clearance. This was a time for the most careful driving, and a time when the car itself was placed on its mettle.

Finally, with this situation past, we put on a final burst of speed and with a run of 182 miles entered San Francisco on Independence Day, proceeded to the ocean's edge, drove the front wheels of the car into the Pacific, just as the rear wheels had been dipped into the Atlantic on June 4, and emptied into the Pacific a canteen of water carried all the way from the Atlantic.

A Novel Method for the Careful Transportation of Race Horses



BEING frequently obliged to send race horses from the training stables in France to the various race courses in England, Edmond Blanc, of Paris, France, has abandoned the railway in favor of a special motor service. Although the journey is not much more than 300 miles, of which 40 are by sea, it was found that the race horses sent by train invariably reached the course in poor condition. Under the motor service the horse is put in a special box at the training stables, the journey is made to Boulogne by road, at this port the horse box is lifted off the chassis and deposited on the deck of the steamer. On arrival at Folkestone the box is mounted on a similar chassis kept in readiness and the journey resumed by road direct to the course on which the horse is to run. The actual time spent from training stable to race course is less than by rail, and as the horse is not disturbed throughout the journey it arrives in good condition. This motor van is an ordinary Latil front drive chassis mounted on twin pneumatic tires.

Semi-Floating Axle Easy on Bearings

When Skidding, Bearing Overload May Be 475 Per Cent With Full-Floating Axle — Stresses Due To Skidding Are More Important Than Those Due to Rolling

By Arthur M. Laycock, Chief Engineer, The Sheldon Axle Co.

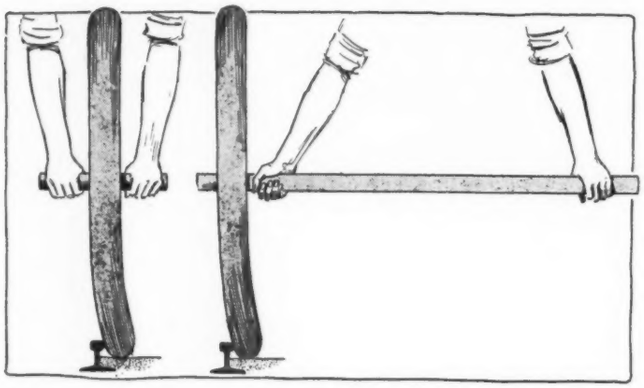


Fig. 1—Illustration to show the difference between the full and semi-floating axles when skidding. The latter has the mechanical advantage

¶ *EDITOR'S NOTE—In response to a letter signed by F. N. S., New Matamoras, O., asking* THE AUTOMOBILE *to publish a discussion of the relative merits of the semi-floating and floating types of axles, requests were sent to several of the representative car and axle manufacturers asking them to give their views.*

Below is the reply of the Sheldon Axle Co., Wilkes-Barre, Pa., prepared by Arthur M. Laycock, chief engineer, dealing exhaustively with the subject. While the curves and diagrams may look forbidding to the average reader, it will be found that, although the subject is a technical one, it is so admirably presented that anyone should be able to comprehend it and derive benefit from it.

Replies from the Weston-Mott Co. and the Packard Motor Car Co. were presented in THE AUTOMOBILE *for July 30 and a paper from the Pierce-Arrow Motor Car Co. appeared in the issue for July 23.*

THE difference in stresses in the semi- and full-floating types is simply illustrated in Fig. 1. It would be absurd for anyone to attempt to hold a wheel straight up when rolling against a street car track, for instance, in the manner shown by the left illustration. The right one shows the only proper way to counteract these forces.

In other words, the bearing pressures, when skidding, are much less when the semi-floating axle is used; or, with the same factor of safety, smaller bearings may be used.

At the present time there are unquestionably many mistaken ideas concerning relative merits of the floating versus semi-floating construction as applied to the automobile, but it is rather difficult to convey to the reader an intelligent expression of these designs without resorting to higher mathematics.

Some of the illustrations, given herewith, are very simple in order to drive home the outstanding superiority of the semi-floating construction, particularly so when one takes as a base the forces acting on the side of the wheel instead of the straight static loads. One cannot attach too much importance to the advisability of working from this base.

It is utterly impossible to expect any trouble on general design from straight rolling loads, no matter how much they are overloaded, but the moment the wheel strikes a large cobblestone a glancing blow, brushes against the curb roughly, or even only side-skids on a good asphalt road, the pressures on the bearings and tubes are tremendously augmented.

Take a 5-ton truck with 25 per cent. overload on a country road where the ruts are rather deep, and observe the way

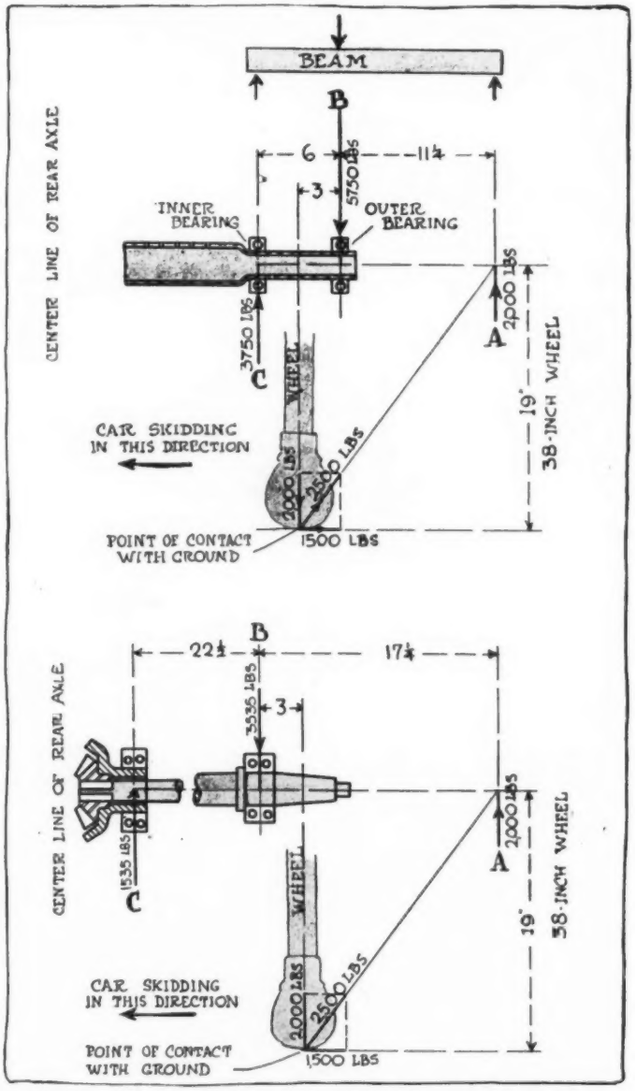


Fig. 2—Graphical method of determining the axle bearing stresses on semi and full-floating axles when skidding. It is assumed that the wheel load in both cases is 2,000 pounds. The wheels are 38 inches in diameter and the sketches of both axles are to scale. The full-floating axle is shown above, and the semi-floating below. A study of the text will show that the skidding of the wheel to the left, in the case of the full-floating axle, produces an upward stress of 3,750 pounds on the inner bearing C and one of 5,750 pounds at the outer bearing B. For simplicity it might be considered that these pressures were obtained by applying a force of 2,000 pounds at A, which is 11¼ inches from B. The accuracy of this assumption is proved by the graphical solution. In other words, the stresses at this point are similar to those acting on the beam at the very top.

the rear end will slew around from one rut to another. In some instances the whole dead weight is stopped in its side swing with the side of the rut. One can only imagine what enormous stresses are set up in these parts, even when only running from 12 to 15 miles per hour.

We will take the other extremes—the same 5-ton machine operating in the down-town districts where it is subjected frequently to turning corners at fair speed and skidding against the street car tracks and curbstones. It has been proven conclusively that these same machines have much more bearing and axle troubles than the ones that have to run on long straightaway runs to outlying districts, taking the same chassis and running under almost identical conditions, with this exception.

The writer has in mind a fleet of large trucks operating in Chicago at the present time, and this certainly proves beyond any shadow of a doubt that these forces are the only ones to take into consideration and not the static load action in a vertical direction on the axles.

Fig. 3 shows a very simple graphical method of comparing the two constructions.

It might be well to note in the first place that this is approximately a 1-ton rear axle with 2,000 pounds on the spoke line and that the full-floating design has a very liberal center-to-center distance for a 1-ton truck, which, of course, shows up this construction very much more favorably than if the center-to-center distance had been closer as in a good many existing designs.

Graphic Comparison of Stresses

The strains on the bearings when a car is skidding, compared graphically in Fig. 2, demonstrate that under the loading assumed, the outer bearing of the full floating type is subjected to a maximum load of 5,750 pounds while the corresponding bearing of the semi-floating type must carry a load of 3,535 pounds. At the same time the load on the inner bearing of the floating axle is 3,750 pounds, while the inner bearing of the semi-floating type carries a load of 1,535 pounds.

These results are arrived at by assuming that the weight resting on the 38-inch wheel is 2,000 pounds, as indicated, that the coefficient of friction between the tire and the road is 75 per cent. and that therefore if the car skids there will be a side thrust of .75 times 2,000 or 1,500 pounds. Therefore there are two forces acting at the rim of the wheel where it comes into contact with the ground. Assuming that the car is skidding to the left, then the thrust due to this is represented by a 1,500-lb. force in the opposite direction and then there is the upward reaction due to the weight. It is these two forces that must be resisted by the axle tubing.

Drawing a parallelogram of forces at the point of contact, the resultant or equivalent force acting at this point is seen to be 2,500 pounds and in the direction shown. The loads on the axle bearings can then be determined by projecting the resultant to the center line of the axle A extended, and reconstructing the parallelogram of forces it is seen that a 2,000-pound force applied at A, which is 11 1-4 inches from the center line of the wheel, will produce exactly the same strain as the 2,500-pound force applied at the point of contact of the wheel with the ground.

In order to find, in a simple manner, the stresses in the bearings at B and C, we may consider that we have a beam, Fig. 2, with loads placed at A, B and C. The load at A is 2,000 pounds, as already determined. Then the load on the inner bearing, considering that the bearing is pivoted at B, is

$$\frac{11\ 1\text{-}4 \times 2{,}000}{6} = 3{,}750 \text{ pounds}$$

To understand the above operation does not require a knowledge of mathematics. It is evident that with a load of 2,000 pounds 11 1-4 inches from the pivotal point or fulcrum, the bending moment is 2,000 x 11 1-4 and that a certain weight must be found on the other side to balance this, at a point 6 inches from this fulcrum. By the above simple calculation, it is found that this weight or force is 3,750 pounds.

Still keeping in mind that, to all intents and purposes, that we are dealing with a beam, we find that we have forces at A and C acting upward and that the one at B acts downward. If the axle is to maintain its equilibrium, the upward and downward forces must equal each other. Therefore, the force at B must be the sum of those at A and C, or 5,750 pounds.

Now, it is interesting to note that this pressure is as great as 5,750 pounds while a choice of bearing is undoubtedly

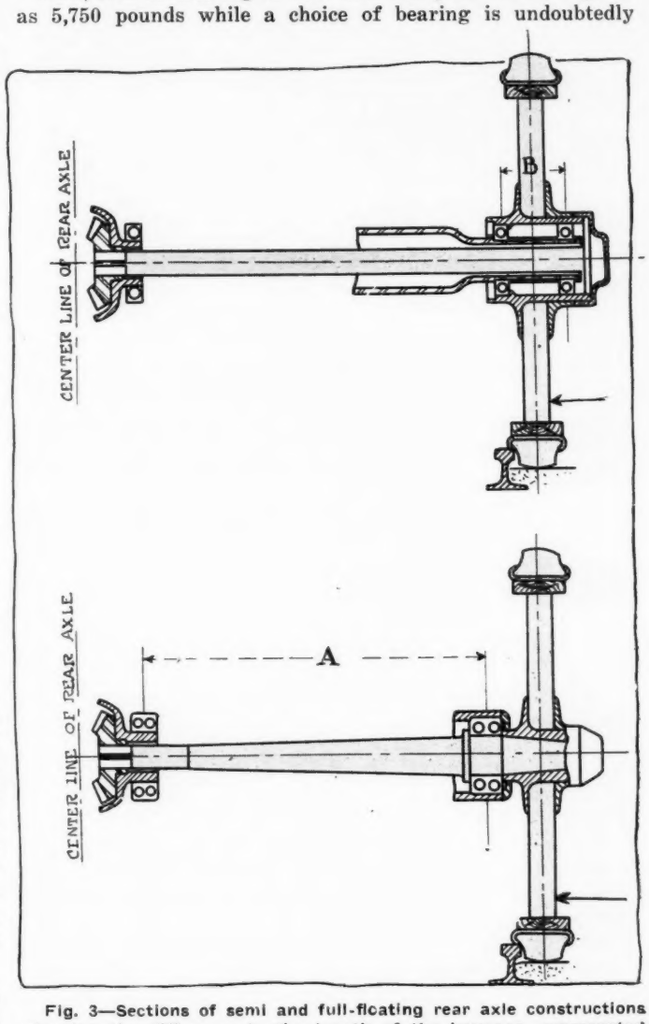


Fig. 3—Sections of semi and full-floating rear axle constructions showing the difference in the length of the leverage, represented by the distances A and B between the bearings, when the car is skidding

made for 1,000 pounds, seeing that the vertical load on the spoke is 2,000 pounds for the two bearings, or you will notice under these conditions the outer bearing has an overload of 475 per cent.

The calculations for the semi-floating type are identical. But owing to the difference in construction, the 2,000-pound force at A is 17 1-4 inches from the center line of the wheel. Further it will be noted that the bearing C is located at the differential instead of in the wheel hub. B is in exactly the same position, namely, 3 inches to the left of the center line of the wheel.

The load on the differential bearing is

$$\frac{2{,}000 \times 17\ 1\text{-}4}{22\ 1\text{-}2} = 1{,}535 \text{ pounds}$$

The load at B is the sum of the other two, or 3,535 pounds.

You will notice a very radical difference between this construction and the upper one inasmuch as the reactions are

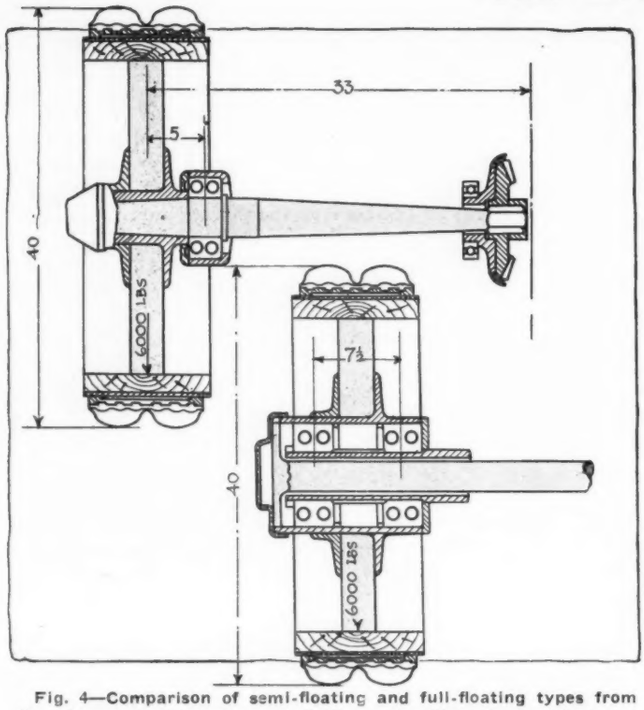


Fig. 4—Comparison of semi-floating and full-floating types from the viewpoint of bearing cost, both constructions having the same factor of safety. The dynamic load on the upper, which is a semi-floating construction, is 10,360, while the capacity of this bearing at 200 revolutions per minute is 17,000, that is, it is 64¼ per cent. stronger than actually required. The cost of these bearings is $19.50. In the full-floating type, which is the lower, the capacity of the bearing to have a factor of safety of 64¼ per cent. would need to be 15.910 times 64¼ plus 15,910, which equals 26,100 pounds. The cost of these bearings would be $76

taken on 22 1-2-inch centers against 6 inches on the floating type.

It is well to also notice that a choice of bearing would be made here for 2,000 pounds, which, of course, would give one a very much larger bearing.

Taking the bearing at its rated capacity, this bearing under these extreme conditions is only overloaded 76 per cent. against 475 per cent. on the floating, while the illustration as shown on Fig. 3 shows a fair balance in design for each construction, but with this great difference that the upper illustration can never withstand the same side pressures that the lower one can.

Building a full-floating type axle with the same factor of safety on the bearings as in the semi-floating, it would have to be in about the same scale as shown on Fig. 4.

You will notice in this diagram—which is self-explanatory—that the bearing cost is quite an item and one of the principal reasons the semi-floating has not had a larger following is from the fact that our leading axle manufacturers usually sell bearings as well.

Skidding Five Times Static Load

A good general idea as to the maximum loads on the bearings when side skidding, as compared to the static, can be obtained from the following example: The maximum load on a certain hub is 5,860 pounds. This, of course, is carried on two bearings—the inner and outer. This gives 2,930 pounds on each bearing, while, when side skidding, the outer one is subjected to a load of 15,085 pounds and the inner one to 15,910 pounds. This is approximately five times the static load.

Of course, these figures neglect sprocket pull, spoke and rim location and can only be used in a general way.

There are axles at the present time on the market with almost half the center-to-center distance of this particular one, and, instead of being five times the static, they approach ten times the static.

Turning now to Fig. 5, you will note that this particular driveshaft is well taken care of on the spoke line. It is purposely weakened at the inner end so that in case of failure you can always be brought home on the wheels. The semi-floating construction, as shown, may suffer in the same way, as the double side chain drive, when an axle breaks the truck is absolutely disabled and not able to get home. In designing an axle in this manner, the writer has never known an axle to break under the wheel. The particular shaft as shown on Fig. 6 is now used on a 3-ton worm-drive axle, and made from the very best steel procurable, and will unquestionably carry the loads it is designed for.

The stress as shown here is derived from a 50 per cent. overload with 80 per cent. on the rear, and even under these conditions, it will be impossible to break the axle on the spoke line.

Some of the fastest cars in the world have held tenaciously to this construction. Take, for instance, the Blitzen-Benz, and where the greatest possible strength for the least weight is desired one must of necessity take this construction, while one of our most popular 1 1-2-ton live axle drive trucks has given an excellent account of itself in real rough work. One of the most expensive cars built, the Pierce-Arrow, has used this constantly, even for the earliest designs. Taking the other extreme, the Ford, it would be impossible to design a rear axle construction stronger than this one for the same weight and price. These people must have had an early appreciation of the robust strength of this design.

It might be well to mention the three-quarter-floating, where the static load is taken on the tube and drive is taken through the shaft. This, of course, is in a class between the semi- and full-floating type. The popular erroneous idea with reference to the three-quarter-floating is in regard to the driveshaft being subjected to purely torsional strains, but it can be easily shown that the driveshaft is taking the combined bending and torsional strains as in the semi-float-

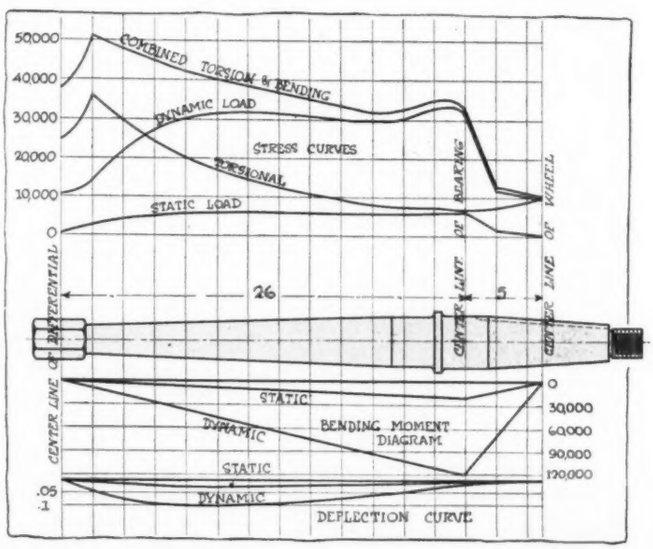


Fig. 5—Upper—Diagram showing combined bending and torsional strains at various points on an axle shaft when using a 40-inch wheel. It will be noted that there are four curves, the top one, which is marked combined torsion and bending, is a combination of the other three obtained by adding the ordinates. For instance, the static load at the extreme left ordinate is 1,000 pounds, the dynamic load is slightly over 11,000 pounds and the torsional load is about 25,000. Adding these three together the combined load at this point on the axle is about 37,000 pounds, which is correct. The static load is that bending moment which is produced by the weight on that wheel, the dynamic load that produced by skidding and the torsional load that caused by the twisting of the start when power is being transmitted

Fig. 6—Middle—Bending moment diagram. Lower—Deflection curves for bending moment diagram above

ing construction, and the only advantage the three-quarter would have over the semi-floating would be that you can take out the driveshafts without jacking up the car as in the floating type, but with this very great difference that the whole load is supported on one bearing momentarily, and if the car is standing on uneven ground the pressure on the end of the tube and bearing might be so great as to permanently injure it. Figuring that the driveshaft is a critical part of the construction, and taking into consideration that in order to have it safe it must have a very large diameter, when these dimensions are realized one has to add to this already liberal size twice the thickness of the tube plus the clearance, one can imagine the very large size of bearing that this particular construction entails, which, while it might be taken from the lighter series, entails such heavy housings, etc., as to make it undesirable from this view-point.

The writer has been repeatedly told that it has a further advantage of being able to get home on the one bearing in case of driveshaft failure. When this occurs on rough roads, it is an experience never to be forgotten, as it usually ends disastrously not only for the bearings but for the axle tube as well. The absence of support throws such a pinching action on the bearing that it is not long before it collapses entirely and brings the closure down on the tube, cutting off the tube and finally dropping the whole load.

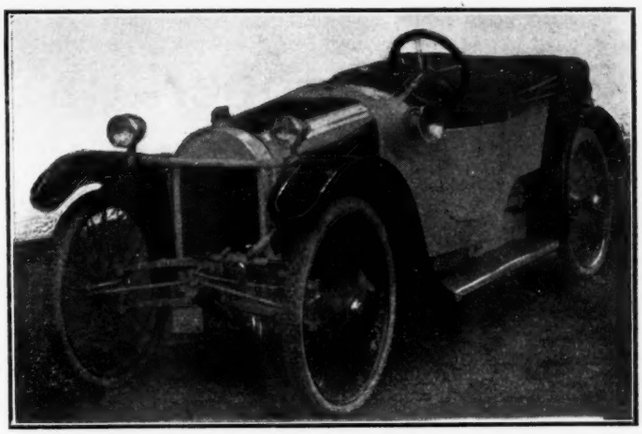
The only disadvantage of the semi-floating construction is the inability to take the driveshaft out without jacking up the car. In some of the earlier types of axles it was exceedingly difficult to take them apart on account of first having to split the rear axle in order to release the inner end. Modern construction, of course, makes it comparatively easy to take out the differential when the side shafts are withdrawn, and all that is necessary on a nicely designed semi-floating construction axle is to jack up the rear end, undo two bolts on each hub, take out the differential; and the driveshafts can be taken out quite easily, but, due to the great factor of safety that a properly designed semi-floating construction insures, the axle is one of the last things to give trouble.

The writer has had considerable experience with this form of drive, and wherever the combined bending and torsion have been properly taken care of, he has yet to see a single failure at the wheel end, and in these days of lightweight construction, we prophesy that it will have a much larger following than in the past.

—

New Imp Has Four-Cylinder Water-Cooled Motor

IMP the Second is the name of the 1915 cyclecar announced by the W. H. McIntyre Co., Auburn, Ind. The new model of the Imp is quite a different car from the original Imp of 1914. It has a four-cylinder water-cooled motor instead of the two-cylinder V-type engine used in the earlier model. The friction drive is retained, but instead of final drive by V-belts a single roller chain is used, driving a live rear axle. The new Imp, instead of being a tandem seater, is now side-by-side, and in general appearance is like a standard roadster. It is stated that weight has been reduced considerably and many refinements incorporated. The motor has a bore and stroke of 2¾ by 4 inches with cylinders of the L-head type cast in block, and mounted on an aluminum crankcase. The motor is thermo-syphon cooled, and is oiled by splash assisted by a plunger pump. Both intake and exhaust manifold are cast integrally. Magneto ignition has been discarded and a unisparker substituted.



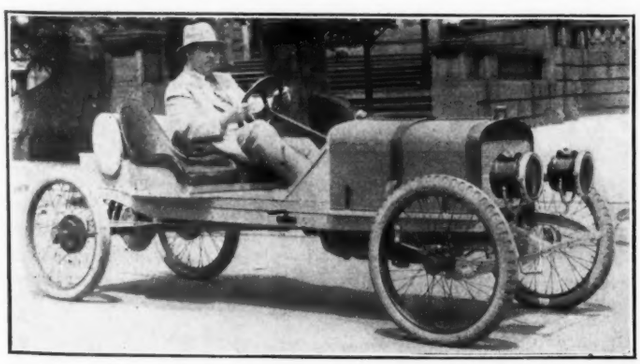
New Model Imp with water-cooled motor and chain drive

Gearless Differential Used

The rear axle incorporates a gearless differential whose main feature is said to be that it prevents skidding. The new Imp has left drive and is equipped with wire wheels, and 28 by 2 1-2-inch tires. The rack-and-pinion steering, double transverse semi-elliptic front springs and cantilever rear springs are retained.

The new side-by-side roadster body has artificial leather upholstering and the seat is 37 inches wide and 16 inches deep with a high back to make for comfortable riding. The fuel tank of the new Imp has a capacity of 5 gallons, and is located in the cowl. The Imp prices for 1915 are as follows: $395 including horn and electric light, $420 with top, curtains and folding windshield, and $495 completely equipped, including electric cranker and generator.

All models are thoroughly tested before they are packed for shipment.



Sporty looking C. A. C. roadster with four-cylinder water-cooled motor

—

C. A. C. Roadster Will Do Fifty

Fifty miles per hour is claimed for the C. A. C. roadster, a sporty-looking machine, with bucket seats resting on the floor, oval tank in the rear and raked steering column. It is manufactured by the Coey Motor Co., Chicago, Ill., and sells for $425. The motor is a four-cylinder, four-cycle, water-cooled type, with a bore of 2.75 inches and a stroke of 4 inches. A Berling magneto is fitted and thermo-syphon cooling is used. Power is transmitted to a three-speed gearbox by a cone clutch. These members are combined into one unit suspended at three points.

The frame is made of pressed steel with half-elliptic springs at the front and three-quarter elliptics at the rear. Double-acting brakes are fitted to the rear wheel drums. The steering is a rack-and-pinion type paced on the left. Center control is used. The equipment includes two large gas lamps and one oil tail lamp. A top is fitted for $25 additional.

Proper Temperature Is the Real Essential in Vulcanization

The Automobile Engineers' Forum

Source of Heat Is Immaterial, Says Vulcanizer Maker, Who Scores Theory That Moisture Enters Into Process—Automatic Temperature Control a Necessity To Prevent Burning of the Rubber—Regulation by Thermostat

WAUPUN, WIS.—Editor THE AUTOMOBILE:—Many car users seem to have the impression that the source of heat used in vulcanizers has something to do with the process of vulcanizing, in other words, that the nature of the heat, whether steam or electric, possesses some factors that share in the vulcanizing process.

Many statements have been circulated to the effect that steam is the only successful vulcanizing medium. They probably originated from the fact that tire manufacturers find steam to be the only convenient means of heating their huge vulcanizing devices to a uniform temperature. The idea has been fostered by a class of repair men who feared for their profits should the simplicity of the vulcanizing process become generally known.

As manufacturers of a complete line of portable vulcanizers for every requirement—some heated by electricity, others by steam, still others by radiation from a gasoline, or alcohol lamp, we feel that we can speak with the authority of absolute knowledge.

No Moisture Touches Tire

The supposed infallibility of steam vulcanizers has been attributed to the fact that they supplied a moist heat. The absurdity of this theory is apparent when it is considered that in no portable steam vulcanizer does any moisture come into contact with the tire. If it did the repair would very likely be spoiled. So at least an eighth of an inch of solid metal is between the steam and the tire. No scientific instrument is delicate enough to detect whether the surface of any vulcanizer is heated by steam or by some other source of heat.

Proper Temperature the Real Factor

The real essential to perfect vulcanization is the supplying of heat *at the proper temperature*. Automatic maintenance of the vulcanizing temperature is absolutely essential unless the operator of the vulcanizer wants to watch his vulcanizer and regulate its temperature by hand. Without an automatic temperature control there is nothing to prevent the temperature of confined steam from becoming high enough to burn rubber. If the steam is not confined it cannot become hot enough to vulcanize. Vulcanization occurs too slowly to be practicable at temperatures below 250 degrees Fahrenheit. Unconfined steam cannot be hotter than the boiling point of water, 212 degrees Fahrenheit.

The best results in vulcanizing are obtained only when the temperature is automatically maintained at a uniform degree throughout the time of curing.

Regulation by Thermostat

This automatic regulation of temperature is easily obtained by the use of a thermostat. Two strips of metal such as brass and steel are riveted together making a solid bar. When heat is applied the brass expands faster than the steel so that the bar bends. The amount of bend is proportionate to the temperature. The bar of thermostat is fastened to the vulcanizing surface in such a way that its bending either operates a damper in the flue of the steam vulcanizer, or regulates the amount of current flowing in an electric vulcanizer. Thus the temperature is automatically held exactly at the degree most suitable for vulcanizing without the operator having to give any thought to it.

No Learning Required

Anyone can use a vulcanizer of this sort without having to learn the vulcanizing business because nothing is left to his care except removing the vulcanizer from the tire when the repair has been finished.—C. A. SHALER CO.

Favors Single-Wire System To Prevent Cross-Connections

NEW YORK CITY—Editor THE AUTOMOBILE:—We are exceedingly in favor of the single-wire system, inasmuch as from very careful experimenting and research work we find it to be a much simpler and more reliable system than either the two or three-wire system. Also, it makes it practically impossible for the average layman to make any cross-connections.

This is one of the most important points which is borne in mind in the design of our single-wire fittings. A single-wire system, when properly installed, makes a neat appearance and looks very simple and from every point of view is more reliable than the multiple systems.—V. W. KLIESRATH, Chief Engineer, Bosch Magneto Co.

Uses Parabolic Lens of Golden Tint for Headlights

DAYTON, O.—Editor THE AUTOMOBILE—We believe it will be of interest to you to know that we have overcome the complaint of dazzling headlights for automobiles, and the large business which we have secured is sufficient proof that we have solved this problem.

Instead of using a special dimming device for reducing the glare, a special reflector is used in the construction of our automobile headlights. This reflector is a parabolic lens mirror of a golden tint made from the highest grade of optical glass. The glass parabola is coated with a pure silver backing, and this is covered with a protecting layer of metallic copper. An aluminum finish is given to the copper to prevent tarnishing.

Glaring White Element Eliminated

This yellow tinted mirror overcomes the blinding glare so apparent where a silver reflector is used. The glaring white

element is entirely absent, as the golden tint absorbs the ultra-violet rays to a great extent. This reduces the glare, at the same time furnishing a light which will penetrate fog and dust to a greater extent than the rays of light from a silver reflector.

The rays of light are just as powerful as from any other lamp. The light so nearly duplicates daylight that objects along the road are not distorted, neither are holes or rough places in the road magnified.—THE APPLE ELECTRIC CO.

Favors Extreme Simplicity in Design for Service and Economy

ROCHESTER, N. Y.—Editor THE AUTOMOBILE:—The Society of Automobile Engineers, at their recent convention at Cape May, N. J., considered the subject of the Ideal Car of sufficient interest and importance to have papers prepared and read regarding it. Since then we have heard very little about it, though the fact that this eminent body had discussed the pros and cons of the car of the future would seem to indicate that at least a few of our many enthusiastic automobilists would have some opinions on the subject to offer.

When THE AUTOMOBILE conducted a department entitled The Ideal Car, a year or two ago, I was one of its readers who ventured to contribute my conception of the subject. And since that time the developments of engineering practice, design and construction have only served to strengthen my belief that the ideal car is one which will give a maximum of service with a minimum of trouble, care and expense.

Building the Car Simple

For the past 7 years I have been an automobile owner and my experience has been that the more parts and attachments a car has the more things there are to get out of order, and, consequently, the higher is the proportion of probability that when you take the car out something will go wrong, either on the road or soon after the return from the trip.

In view of this, as our modern cars became more complicated and I found that most of my spare time was being consumed in taking care of any number of more or less superfluous devices, which were described in the catalogues as luxuries, I determined to emancipate myself from these cares of complication and, accordingly, purchased a stripped chassis of well-known make with none of the fashionable excrescences which I wished to avoid. I fitted up this chassis with the simple necessities and discarded everything possible without impairing comfort and serviceability and the result is that I have a car with which I can travel for weeks at a time without any other care than keeping up lubrication, cooling water and fuel supplies.—A. L. BOOTH, M. E.

Recent Court Decisions—Wagon on Highway

By George F. Kaiser

NEW YORK COURT says that when a teamster stops his wagon diagonally across the highway, leaving insufficient space for an automobile to pass in the rear of the wagon, when the car is in plain sight, he is guilty of negligence, and the employer must stand for any damages which result to the automobile by reason of the same.

An automobile was coasting on a down grade at a speed of about 20 miles an hour. About 330 feet from a depression at the side of the road, a teamster came along the lane toward the highway. As the team reached the highway, the motorist blew his horn, and the teamster looked up and then stopped his wagon diagonally across the road, leaving insufficient room for the motorist to pass. The motorist attempted to throw his gear into the reverse, but was unable to do so because the gear caught. He then attempted to pass in front of the horses, but the automobile fell into the depression, and the car finally struck a telephone pole.

The car was damaged, and the motorist sued the wagon owner, and recovered a judgment to the sum of $200.15. The owner of the wagon appealed the case, but the higher court said that the judgment in favor of the motorist was proper, as the negligence was all on the part of the driver of the wagon, and because of this negligence the accident occurred.—*Manion vs. Loomis Sanatorium*, 162 N. Y. Appel. Div. N. Y. 421.

Motorist vs. Motorist for Collision

In an action in the Rhode Island Court, where one motorist sued another motorist for damage caused by a collision when they were both going in the same direction on a broad highway, the Court said that the questions which determined the liability of the respective motorists were: "Did the plaintiff (the injured motorist) at the time and place of the collision leave room enough at his left for the defendant to pass him in safety and without striking his machine?" and "Did he block the road ahead of the other car before the other party attempted to pass him?"

In this case one motorist sued another for damage caused by a collision. Both cars were going at a moderate speed in the same direction along a highway which was 25 feet wide and on which no other vehicles were at the time. It seems that some time previous to the accident words had passed between the respective drivers of the cars because of the fact that the car ahead slowed up suddenly at a railroad crossing without giving any warning and the rear car nearly crashed into it.

The Court found that the party against whom the suit was brought was not liable as the one bringing the suit failed to prove the law of Massachusetts, which provides that one car shall pass another on the left and shall not turn until there is ample room to clear the car which has been passed. On the failure to prove this law the common law was held to be in force, under which one vehicle was not obliged to turn off for another coming from behind if there was sufficient room for the other car to pass on either side with safety.—*O'Donnell vs. Johnson*, 90 *Atlantic* (*R. I.*), 165.

Policeman Loses Case

New York Court says that when a police officer is riding in an automobile in the course of his duty, and is injured by reason of one of the wheels collapsing, he must nevertheless prove negligence on the part of the city or chauffeur before he can recover damages.

In this case, while a policeman who had been assigned to the Department of Finance, was accompanying a paymaster in the Croton Aqueduct, he was injured by reason of one of the wheels collapsing on striking a large stone. The car turned over, and the policeman and another man were killed.

His administratrix brought an action to recover for his death, and although the trial court gave judgment in her favor in the sum of $7,000, the higher court decided when the city appealed, the court made a mistake in not putting the burden of proof of negligence on the administratrix, and further before her recovery could be had against the City it was necessary to show that the chauffeur was in an intoxicated condition, or was driving the car recklessly or in an improper manner.—*McCormack vs. City of New York*, 162 Appel. Div. N. Y. 539.

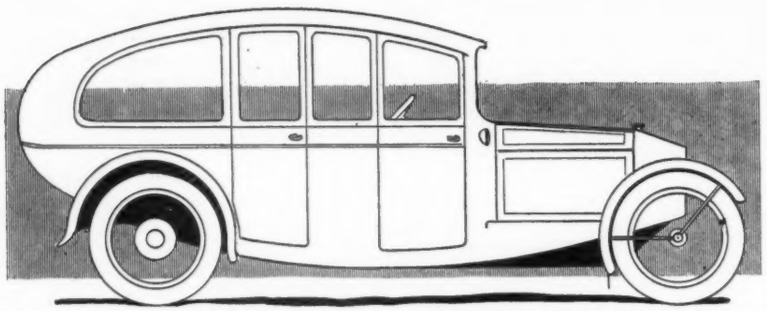


Fig 1—Ideal limousine where underslung floor 10 inches from the ground is used to make the car extremely low

The Rostrum

Two-Cycle Motors Favored In Large Installations

EDITOR THE AUTOMOBILE:—I notice in the **Ros**trum this week E. R. Crilley, "Thinks Two-Cycle Motors are Passé." I would suggest that the correspondent get in touch with a well-equipped public library and take a few notes before he condemns a principle he evidently does not understand. I would suggest that he study *Engineering* and *The Engineer* of London, *The Gas Engine*, Cincinnati, Ohio, and note where the two-cycle engine is being used in preference to the 1876 principle.

Following are extracts to prove my claim:

Engineering, London, April 24, 1914, The development of High Power Marine Engines. In considering the future possibilities, *only* the two-stroke cycle will be dealt with, as the power of the four-cycle engine is limited by the difficulties of dealing with the exhaust. The weight and space occupied by the two-cycle engine is not great. To obtain the maximum actual mean effective pressure per revolution, the two-cycle engine will be adopted.

The Gas Engine, Cincinnati, January, 1914, page 47, Krupp builds six-cylinder, two-cycle engines for submarines, 900 horsepower. *The Gas Engine*, February, 1914, page 74, Development of the submarine, with the French and German submarines in which the two-stroke engines have been most common, compressors are of course used.

The Gas Engine, August, 1914, page 505: A larger two-stroke cycle engine than this has been built however. This is a six-cylinder engine of 4,000 horsepower built by Sulzer Brothers, a single acting two-stroke cylinder has been built for experimental purposes for which 1,500 to 1,800 horsepower was obtained without serious difficulty.

Finally, Mr. Knight had to take his American design to England to be appreciated. Europe won the first four prizes at the International races at Indianapolis. They have some new valve gears that are positive in action. I will venture to predict the fashion may get a jar due to progressive work along two-cycle lines where some of the leading concerns are busy trying to eliminate inherent defect in the 1876 principle.

Cleveland, O. LABOR OMNIA VINCIT.

How to Install a Unisparker

Editor THE AUTOMOBILE:—1—Kindly explain and show by diagram the manner of installing an Atwater-Kent Unisparker on a Model F Buick Car.

2—The non-distribution type igniter produces a spark in both cylinders at the same time and, as I understand it, the current flows from one coil to both cylinders, dividing, as it were, into two streams. Is this so, and is not the spark weakened?

3—Would better ignition on my car be secured if I used a spark plug with a long lower end? The wall of cylinder at spark plug hole is 1 3-8 inches deep and with an ordinary plug the electrodes reach down only about 5-8 inch. It seems to me that if the electrodes reached through the hole the lower end of plug would be kept more free from soot.

4—In assembling my car I found two marks on the camshaft gearing and it was impossible for me to know which one to go by. The difference amounts to one tooth or, if a mark on the angle of the crankshaft is taken into account, two teeth. Explain how the gears must be set.

5—I have battery ignition on my car. Would it be good practice to connect an electric horn to the set of batteries used for ignition?

Iowa Park, Texas. HORSELESS.

—1—The Atwater-Kent Unisparker is attached to the timer shaft after removing the commutator. The loose gear is then placed in the bracket, Fig. 3. The bracket is put on the bronze bushing which forms the bearing for the timer shaft, making the inside of the bracket even with the face of the bushing and the loose gear on the timer shaft. Then clamp the bracket by securely tightening the two set screws. Finally adjust the loose gear to run smoothly with the other one. Drill and pin the loose gear to the timer shaft.

The timing of the Unisparker is accomplished by bringing the piston in one of the cylinders to top dead center on the compression stroke. Turn the motor over until the mark on the flywheel indicates that the pistons are on dead center and then determine which cylinder is on its firing stroke by noting which cylinder has both valves closed.

Then, with the spark lever retarded, set the breaker mechanism so that the contacts breaking the circuit to the spark plug in this cylinder are just ready to separate. The timing adjustment is obtained by loosening the screw on the collar of the Unisparker.

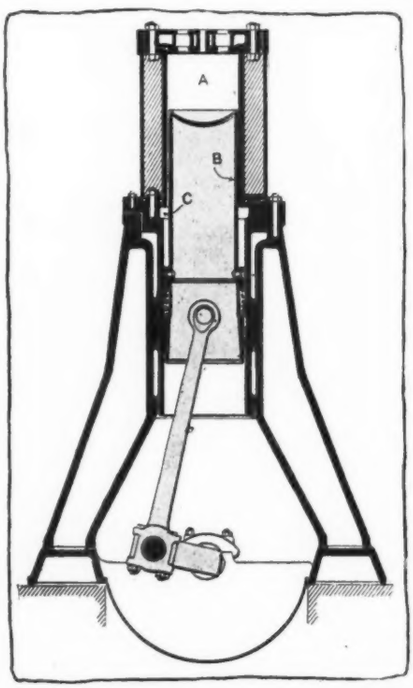


Fig. 2—Motor with uncooled cylinder. The upper part of the piston does not touch the hot cylinder. Note packing at C

The only other adjustment is the width of gap at the contact points. The space should be between 1-32 and 1-64 inch, depending upon the strength of the batteries, spark heat required, etc. The spark can be made hotter by decreasing this distance and current economized by increasing the distance. Once or twice a season these contacts should be examined and if rough should be smoothed off by means of a fine file or a piece of

emery cloth on a flat stick. The proper adjustment when starting with new dry cells is about 1-32 inch and if a storage battery is used this may be reduced a trifle. At intervals of 600 or 800 miles these contacts should be closed from a quarter to a half a turn, or until regular firing is again obtained. Do not atempt under any circumstances to adjust the tension of the springs.

2—Where the current is not distributed but is allowed to flow to both spark plugs each time that a spark is needed in one, naturally, twice as much current must be used as in a system using a distributer.

3—Some improvement in the operation of the motor will be noted if longer spark plugs are used. You should be able to obtain these spark plugs from any supply dealer.

4—You had better check up the timing by means of the marks on the flywheel. There are two marks quite close together on the flywheel rim. The first one, considering the direction of rotation of the motor, is for exhaust closing, and the second, for intake opening.

5—You do not state whether your battery ignition is of the storage or dry-cell type. If it is the latter, it would be safer to have an extra set of cells for the horn so that there will be no danger of weakening the cells that you are depending on for your ignition.

Reader Designs Novel Limousine

Editor THE AUTOMOBILE:—It seems to me that there is not enough originality to our body design. Nearly every touring car is like every other one and the same applies to closed machines. Furthermore, a body should be practical as well as good looking yet there are many that do not satisfy more than one of these requirements.

A closed body design that departs from standard practice to a large extent is shown in Fig. 1 yet it has many good points and it carries out the streamline idea with more unity than any other design I have seen.

A high V-pointed radiator is used in connection with a sloping hood. The front of the roof slants over to meet the end of the hood, the width of the glass panel only being about 18 inches. Thus the hood makes an almost unbroken line with the roof.

The ideal chassis for such a body should have a four-cylinder motor, with cylinders 4.5 by 6 inches, of medium speed. A cone clutch and three-speed gearset should also be used.

Nor is the roof of the body so low that the passengers are likely to strike their heads, because the floor of the car is underslung from the frame so that it is only 10 inches from the ground—the same as the clearance under the axles and the flywheel. In the ordinary limousine the floor is 20 inches above the ground, so 10 inches is gained in this manner, in other words the car can be made 10 inches lower.

The streamline effect is further accentuated by carrying the sides of the body down to hide the frame members and by fitting bicycle-type fenders that hug the wheels as closely as possible. The doors have invisible edges.

A small objection to this type of body, of course, is the fact that the flooring must be arched over the gearbox and driveshaft but this is of small moment.

Utica, N. Y. F. L. ADAMS.

A Motor Without Cooling

Editor THE AUTOMOBILE:—Do you know whether anyone has ever tried to design a motor without provision for cooling the cylinders. It seems to me that it would be possible to construct a long piston, the lower part of which would be used as a guide, and would not come into direct contact with the hot gases and the upper part would be of slightly smaller diameter so that it would not come into contact with the uncooled walls of the cylinder yet the space between this part and the piston would be so small that no hot gases would pass down to the lower part of the piston, which would be a running fit.

Brockton, Mass. H. E. B.

—This was suggested several years ago by a Frenchman, by the name of Gardee, and while it is not adapted to automobile work it might prove satisfactory for stationary engine service.

As will be seen by the section of the motor shown in Fig. 2, the lower part of the piston works at low temperatures

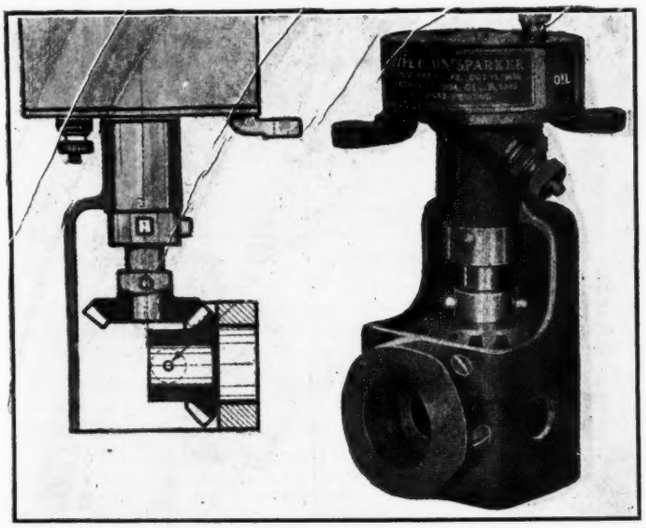


Fig. 3—Atwater-Kent Unisparker for model F Buick

because between the hot part of the motor A and the lubricated piston there is an annular body of gas B which prevents the heat from being transmitted.

It will be noted that such a motor would be too high for automobile work and that the reciprocating parts would be too heavy for the speed required by present-day practice.

Information Concerning Buick C 37

Editor THE AUTOMOBILE:—Kindly give me the following information concerning the Buick 1915, model C 37:

1—Maximum number of revolutions per minute.

2—Gear ratio on high gear.

3—Maximum speed.

4—Weight fully equipped.

5—Also how can demountable rims be kept from rusting?

Christiansburg, Va. T. H. WADE.

—1—The maximum revolutions per minute of the motor is 1,900.

2—The gear ratio on direct drive is 4 to 1.

3—The maximum speed is 50 miles per hour.

4—The weight is 2,950.

5—Demountable rims may be kept from rusting by painting with a good flexible enamel. Clean the rims thoroughly first, and then paint them. Rusting of the rim where it comes into contact with the bead of the tire can be prevented by painting the rim before the tire is put on, with flake graphite mixed up with enough gasoline to make it fluid.

No Companies Selling on Installments

Editor THE AUTOMOBILE:—What automobile company is it that sells its cars on the installment plan, to both the agent and final purchaser? I did not know until a few days ago, that any company was offering such a proposition, but an agent here showed me part of a letter from some company—he would not show me the name—offering to do this.

Windsor, Mo. GEO. P. JAMES.

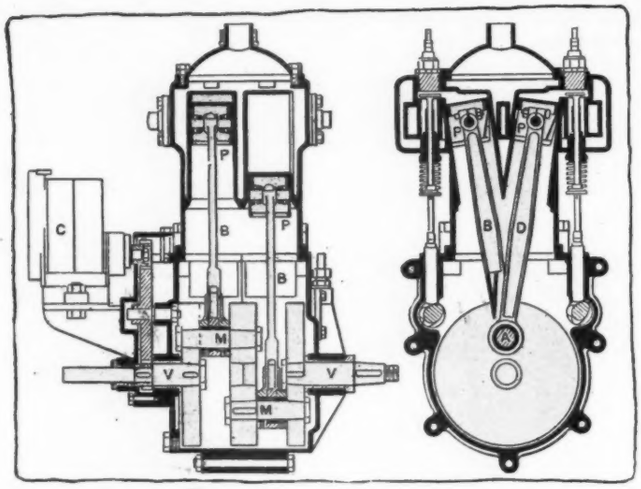


Fig. 4—Two views of four-cylinder V-block motor

—We know of no concern that makes a specialty of selling cars on the installment plan. Undoubtedly some concerns have allowed dealers to pay for their cars in installments where it was desired to offer special inducements to the dealers to take the cars.

Here and there throughout the country dealers are selling cars on the installment plan but this is a matter for the individual dealer to decide and does not concern the manufacturer.

The fact that the dealer you speak of would not let you see the letter would seem to indicate that the understanding was confidential and that the manufacturer was not making similar terms to other dealers.

Explanation of Four-Cylinder V Block

Editor THE AUTOMOBILE:—The other day I was examining a motor which seemed to be of the two-cylinder type with the cylinders cast in a block. I was under the impression that it was an extraordinarily large diametered motor and on inquiring found that it was a four-cylinder motor with the cylinders alongside of each other. Will you kindly show me by means of a diagram how these cylinders are placed?

Hoboken, N. J. CHAS. STEARNS.

—The motor described by you is shown in section in Fig. 4. It is seen that the cylinders are inclined to form a V-shape with each pair of connecting-rods working on the same crank. There are three flywheels within the motor which are connected to the cranks and crankshaft in the manner shown in the longitudinal section through the motor.

Description of Oakland Ignition

Editor THE AUTOMOBILE:—Will you please give me a description of the ignition system used on the Oakland six 48? In the instruction book furnished by the Delco company, I did not quite understand how the current passes to the distributer, from the dry cells, and from the generator.

Buffalo, New York. HENRY J. SLEZAK.

—The Delco ignition system, Fig. 6, used on the Oakland 48, consists of a dual automatic distributer and timer which is carried on the left side of the motor near the front, and a coil for transforming the low-tension current into high-tension.

When ignition current is supplied from the lighting circuit the current passes from the storage battery or the generator, depending on which is furnishing the current, through the switch, and on out through wire A to the low-tension winding of the coil, from whence it passes to the timer and from there to the frame where it is grounded.

The high-tension current generated in the coil runs to the distributer where it is switched to the spark plugs in different cylinders in turn. This current is produced by the magnetic reaction due to the sudden subsidence of current in the primary.

It will be noted that there is a resistance unit just above the timer on the diagram. This is for the purpose of protecting the circuit. Under ordinary conditions the wire remains cool and offers little resistance to the passage of current, but if for any reason the primary circuit should remain closed for any length of time this wire will become heated, its resistance will increase and in this way will reduce the amount of current flowing. In other words this resistance coil becomes heated and reduces the flow of current before the current can injure any other part of the circuit.

Directly above the resistance unit is a condenser.

When the dry cells are used for ignition the operation is the same except that a device called an ignition relay, Fig. 6, is added to the circuit. This device economizes current by breaking the circuit immediately after it has been completed by the time contacts. Thus the circuit is closed a much shorter time than is the case when the circuit is broken by the timer contacts themselves.

How to Install an Ammeter

Editor THE AUTOMOBILE:—Will you please describe a method of attaching an ammeter on a 1914 Buick, Model 25, equipped with the Delco starting and lighting system?

How many miles per hour does this car have to travel to begin charging the storage battery?

Keokuk, Ia. EDWARD MOORE.

—Although you have not stated it, you probably desire to measure the rate of charge and discharge of the battery, and not the consumption of the lights when the generator is supplying the current, etc. The connections are very simple as it is only necessary to place the ammeter in series with either one of the cables running to the storage battery. Cut the cable in two at whichever side is more convenient and attach the ends of the wire to the terminals on the ammeter.

Relative Positions of Armature to Pistons

Editor THE AUTOMOBILE:—As a subscriber to your magazine I take the liberty of asking some information on the correct relative armature positions when compared to the positions of the connecting-rod and timer for different positions of the spark. That is, for a retarded or advanced spark. Can you enlighten me?

Macon, Ga. H. E. LORD.

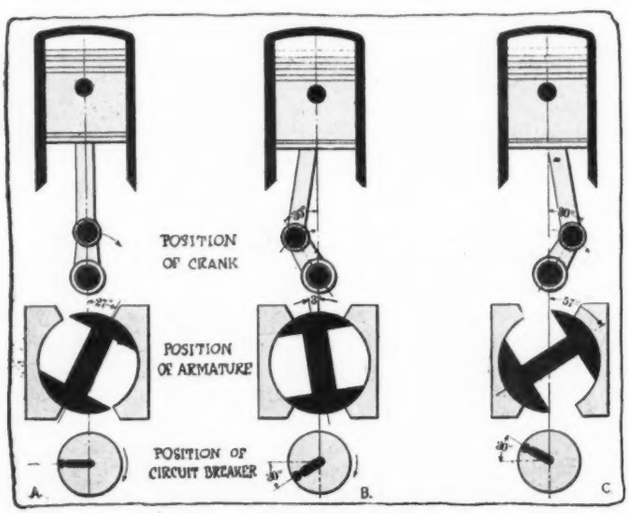


Fig. 5—Diagram showing position of armature for different crank pistons

—The relative positions of the piston and connecting-rod to the armature and the contact-breaker can best be shown by means of a diagram. Such a diagram is given in Fig. 5. The direction of rotation is clockwise, and the maximum spark advance and retardation have been taken as 30 degrees. The position of the armature is so designed that the maximum current will be obtained under the greatest number of conditions of spark advance or retardation.

Differential Gears Hum on Turns

Editor THE AUTOMOBILE:—I have a 1910 car that is in good repair with the exception that the rear axle makes a noise. The noise is not so bad except when I turn a corner. About one year ago I returned the drive shafts and differential to the maker and had a new housing and gears put in. Since then I have put in a new bevel gear driving pinion. If I screw the pinion up as tight as I think it ought to go, it binds.

2—Does it make any difference how many teeth are in a bevel gear in relation to the gear it works in?

Pittsburgh, Pa. R. A. JENKS.

—1—This condition is due to the shifting of the large differential gear so that it moves away from and toward the driving pinion. The cause of this is usually a loose truss rod which permits the housing halves to separate. The left half of the housing should be removed and the bolts reset and tightened and then the truss rod taken up as far as possible to form a rigid construction. If you are not familiar with the work do not attempt it, and under no circumstances should you try to readjust the gears to compensate for the loose rod.

2—The relation of the number of teeth on the driving pinion to the number on the large gear gives the ratio between the number of revolutions the motor makes as compared with the number the wheels make when the car is traveling on high gear. Any change in either the pinion or bevel gear, alters the ratio.

Speed Changes on Electric Cars

Editor THE AUTOMOBILE:—1—Do not the Stearns, Columbia, Palmer-Singer and Moline cars use rotary valve motors?

2—Has a three-point suspension motor any advantages over any other?

3—Has the automobile made the fastest speed made by any vehicle? What is the fastest mile ever traveled, and by whom?

4—Has an electric car any gears or only one speed?

5—How many revolutions per minute will a 36-inch rear wheel make when the car is going 45 miles per hour?

6—What is the S. A. E. rating of a 6-inch, four-cylinder motor?

7—Is the facing used on the clutch of the 1912 Overland made of leather?

8—Could the 1912 Overland, which has a Kenwood oiler, be changed to have a splash system of lubrication without excessive cost?

Conneaut, O. F. A. WAHL.

—1—None of the cars you mention use rotary-valve motors. The Stearns, Columbia and Moline have the Knight sleeve valves. The Palmer-Singer has no rotary valve. The Speedwell is the only car using a rotary valve engine.

2—Adherents of three-point suspension for the motor believe that hanging the engine on three points prevents strains in the engine base and crankshaft due to twists which occur in the frame due to the unevenness of the roads.

3—The fastest mile ever traveled, of which there is an official record, is Bob Burman's mile in the Blitzen Benz, made at Daytona, Fla., April 24, 1911, at a speed of 141.73 miles per hour. Duray, in the 300-horsepower Fiat, traveled a kilometer at the speed of 142.9 miles per hour at Ostend, December 16, 1913, but the official record was not procured for the European regulations called for the distance being covered in both directions. This is the fastest speed ever made in a motor-propelled vehicle.

4—Electric cars in general do not have a speed change similar to that in the gasoline car. They have a number of speed changes, from three to seven, which are obtained by varying the connections between the battery and the motor and inserting resistances in the motor winding, in exactly the same way as it is accomplished in the electric street car.

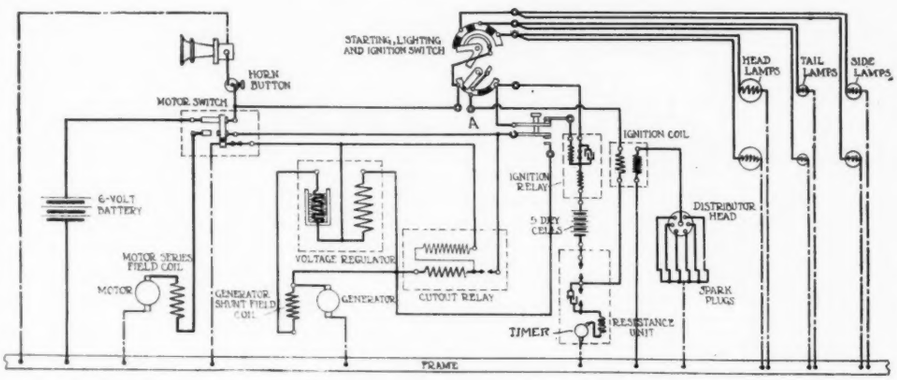


Fig. 6—Delco system used on Oakland six showing method of distributing current to spark plugs

5—Four hundred and twenty revolutions per minute.

6—The horsepower is 57.7.

7—Yes.

8—It is not believed that the advantages of the change would pay for the cost.

Questions Concerning Cadillac

Editor THE AUTOMOBILE:—To what extent did the Cadillac experiment with the six-cylinder motor?

2—What was the first car to use the two-speed rear axle, and who uses them today?

3—Who makes the front and rear axles, radiator, body, wheels, rims, and lamps of the Cadillac, and who makes their frame?

4—Does the Cadillac cast its own motors? If not, who does?

5—Does the Cadillac have a magneto?

6—Who was the first company to use a starter?

Washington, N. J. H. R. BROWN.

—1—A recent statement by the Cadillac company shows they have built experimental six motors in various forms and have tested them in every way known to them.

2—The first car in America to equip with a two-speed rear axle is the Austin. This car and the Cadillac are the only cars so equipped at present.

3 and 4—All of the Cadillac parts except the equipment such as rims, lamps and wheels are either made and assembled by the Cadillac company or partly made or assembled elsewhere. The lamps are of Gray & Davis make, the wheels, Schwartz, and the rims, Kelsey-Booth. The motors are made entirely in the Cadillac shops.

5—No. The Delco combined lighting, starting and ignition system is used.

6—The Winton company is given credit for having been the first to regularly equip with a starter, although experimental models were used before this.

Lead Advantageous in Refining Steel

Uniformity of Heat Permits of Same Degree of Hardening at All Spots, Preventing Internal Strains

"Lead, free from sulphur and other chemical impurities, is of great advantage in hardening steel on account of the uniformity of its heat"—A. L. Riker, Chief Engineer of the Locomobile Co. of America

LEAD as used for hardening and heat treating baths, or what is commercially known as refined lead, is free from sulphur and otherwise chemically pure. This is an absolute requirement for, if the lead contained even a small percentage of sulphur it would result in the pitting of the work on account of the affinity of sulphur for iron.

The use of the lead bath for hardening is, on account of the uniformity of heat, of great advantage in hardening according to those who have employed it, because it enables the work to be hardened all over and not in spots; thereby preventing strains in the metal, and by preventing air from coming in contact with the heated pieces, prevents oxidation, which is a common fault with open fire methods.

The lead bath is of marked advantage for the hardening and tempering of small work, and is of special advantage in hardening the ends of tools, etc., where heating the whole piece would be unnecessary and would even in some instances, spoil the work.

From the standpoint of rapidity the oil method is claimed by its users to be three times as efficient as the open fire, but all pieces except small work should be pre-heated before being placed in the lead bath, otherwise rapid heating would tend to cause the metal to crack.

For Steel Above .7 Per Cent. Carbon

The general range of tool steel contains from .7 per cent. to 1.4 per cent. carbon. The lower figure is used for the easily-weldable steels such as are used in drop forging dies, etc. and the upper figure represents the other extreme such as steels for razors and other hard cutting tools. In referring to the heat treatment it will be understood that the high carbon steels are meant, that is, steels which are sufficiently high in carbon composition not to require the addition of any carbon in hardening them and which are therefore known as self-hardening steels.

When a steel of this class is heated to a high temperature and then plunged into a cooling bath, a change in the internal structure of the metal takes place. The steel as a result becomes hard and brittle. The temperature to which it is necessary to heat the steel to get this hardening effect is what is known as the critical temperature of the metal. At or above this temperature an internal change takes place in that the carbon and iron contents of the steel enter into a new relationship with one another and a hard constitutent known as austenite is formed. Austenite is a solid solution of carbon in iron and in it the carbon may be present up to 2 per cent. The nearer the carbon approaches the 2 per cent. limit, the harder the austenite and the harder the steel. When the steel is cooled rapidly, the austenite for all practical purposes is considered to remain unchanged and thus to give the steel its required hardness.

If the steel is cooled slowly the austenite disappears and in its place there results a mechanical mixture of pure iron and a chemical compound of iron and carbon. The result of this disappearance of austenite is a soft steel.

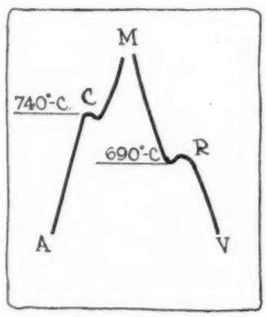
The hardness of steel is thus seen to depend on two factors, first on the amount of carbon there is in it and second upon the rapidity with which it is cooled which determines the amount of austenite actually left unchanged in the steel. If cooling could be instantaneous, then the theoretical result of an unchanged amount of austenite after cooling would be true and the nearer the approach to the instantaneous cooling the less the change in the austenite.

Temperature Rises Regularly

When raw steel is heated uniformly, that is when the amount of heat added is uniform per unit of time the increase in temperature of the steel proceeds regularly up to a certain point in the manner shown in the accompanying illustration. The regular rise in temperature takes place from A to C. At the latter point an absorption of heat takes place which causes a slight fall off in the temperature of the metal. This point which is at about 740 degrees Centigrade with a .9 per cent. carbon steel is known as the calescence point. After this point is passed if the heat is still applied at the same rate the rise in the temperature again becomes steady although not as rapid as at first. The absorption of heat is due to the energy required in forming the austenite. It is therefore necessary in hardening steel to heat it above the point of calescence.

If the steel is allowed to cool regularly, by the abstraction of definite amounts of heat per unit of time the heat will drop uniformly as shown in the curve from M to R and then at a temperature of about 690 degrees Centigrade, a retardation of cooling will be noted, in fact a slight rise in temperature will occur. This point which is known as the recalescence point, is where internal changes which result in the giving out of heat take place. From R to V on the curve the cooling is again uniform.

Should the steel be heated above the calescence point and



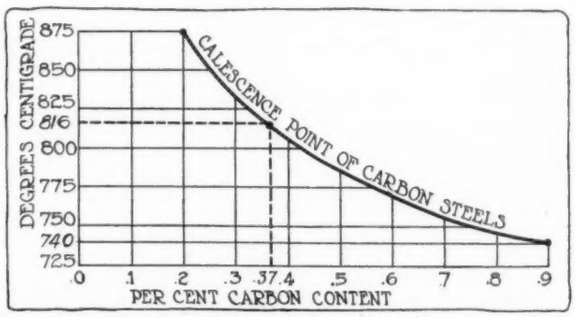


Fig. 1—Left—Rise and fall of temperature of steel heated uniformly. C, calescence point; R, recalescence point. Fig. 2—Right—Approximate curve of calescence points of carbon steels

then the temperature allowed to drop until it had passed below the recalescence point, the characteristics of the steel would not be found to have varied to any extent. The change that takes place at calescence is reversed at the recalescence. If, on the other hand, the steel is cooled suddenly before the temperature has dropped below the point of recalescence, the changes which took place at the point of calescence, notably that of the formation of the austenite, are rendered permanent as far as all practical considerations obtain.

Practical Hardening of Steel

When steel is hardened in a practical way it is necessary to subject it to a temperature somewhat above the calescence point for safety's sake in order that the operator can be sure that the internal changes he desires have taken place. The point of calescence varies with steels of different carbon content and an approximate curve of this carbon variation in steels of from .2 to .9 per cent. carbon is shown in Fig. 2.

After the heating has been completed it must be remembered that the plunge has to be made quickly before the temperature drops below that of recalescence. It must also be remembered that the hardness of the steel will depend on the quickness with which the temperature is brought from above to below the recalescence point. Rapidity is necessary to obtain great hardness and uniformity in cooling rate is necessary to obtain uniformity in hardness.

The rapidity and uniformity of cooling are affected by the following properties of the bath: conductivity, specific heat, density, latent heat of volatization, all of which factors should be high and boiling point, viscosity and initial temperature which should be low. It must be remembered, however that cooling cannot be done too rapidly in many cases on account of the dangers of cracking.

The tempering process which follows the hardening has two primary purposes, the first is to reduce the hardness to the desired point and the second is to remove the internal strains which may have been produced by the sudden chilling of the metal in the hardening work. The tempering process consists of re-heating and then re-cooling but to what temperature the heating is done and at what rate the cooling takes place in securing the desired reduction of austenite depends on the nature of the work and the ideas of the operator.

Lead Best in Hardening

It is in the hardening work that lead meets its best use. It brings the metal above the calescent point quickly, thus saving time. The perfect exclusion of air from the article to be hardened so that no oxidation or burning out of surface carbon can occur is another advantage. The lead bath gives an even heat throughout the article and it is comparatively simple to keep the temperature regulated. The National Lead Co. is making a special lead for this work and guarantees its purity to be 99.9947 per cent. This purity is of the utmost importance or the value of the lead bath is destroyed.

The following is given by the above mentioned company as a typical analysis of refined lead for hardening:

	Per Cent.		Per Cent.
Silver	.0006	Manganese	None
Antimony	.0030	Arsenic	Trace
Tin	None	Sulphur	None
Bismuth	Trace	Phosphorus	None
Copper	.0002		
Cadmium	None	Total impurities	.0053
Iron	.0015	Lead (by difference)	99.9947
Zinc	None		
Nickel and Cobalt	None		100.0000

Good Roads in Egypt Make Demand for Cars

NEW YORK CITY, Aug. 15—The possibilities of Egypt as a motor car market are well set forth in the following extract taken from the *Egyptian Mail* of June 26, 1914:

"Two years ago Egypt was almost as roadless as Albania is today. There were a few roads around Cairo, and you could reach the Pyramids on a first-class macadam road. There were a few other roads to Heliopolis, Zeitoun, and another to Ameadi. Alexandria was worse off.

"It was surprising that motor cars should have any vogue under such conditions, yet there was a good demand for them in Cairo and there always were plenty to be seen in Alexandria.

Last 2 Years' Progress

"The last 2 years have witnessed remarkable changes in Egypt in many respects, but in none more than in the matter of roads. Lord Kitchener saw the need for better roads and was not 6 months in the country before work was being pushed on the road between Cairo and Alexandria. A government department was created exclusively to look after roads, and today there are some hundreds of kilometers of good roads in the Nile delta, along which it is possible to motor in comfort. Every year this road department has been increasing the scope of its activities.

Hard Earth Roads

"The roads are not macadamized, except occasionally in the proximity of big towns, but are made of earth rolled down to form a hard surface. It is not a method calculated to stand heavy traffic, but they are good for speeds from 30 to 40 miles per hour. In one place along the Nile a charming macadamized road has been built, and it is now possible to motor many miles on a macadamized road along the banks of the picturesque Mahmudia Canal.

"This country-wide road activity means an increase in demand for motors, and for a market with widely varying requirements. Cairo and Alexandria will continue to demand cars for town work pure and simple. Most of the best makes of English and French cars are used for this purpose, though it is rare to see anything over 20 horsepower. With native Egyptians the limousine is the most popular type, as it suits the harem better than any other. Open cars preferred range from 12 to 16 horsepower and for this type the demand is greatest. A car of this nature can be used in Cairo and Alexandria as well as anywhere in the provinces. This, too, is the kind of car purchased by the government.

"Then, again, there is a great demand for the small two-seater, the number of bachelors in Egypt being proportionately high amongst the European communities. This class prefer the two-seater.

Want Light Touring Cars

"The motor manufacturer who wishes to push his cars in this country should turn out a strong and light touring car ranging from 12 to 20 horsepower. A car of this kind suitable for the English market with very little alteration, such as the lengthening of springs, a specially large and airy hood and strung rather higher from the ground than an English touring model should do very well."

The Engineering Digest

How to Get a Uniform Light from Lamps with Parabolic Reflectors by Suitable Adjustments

MANUFACTURERS of headlights are expected to provide a combination of light source and reflector which can be adjusted to give a suitable illumination. In some cases a lens forms part of the equipment, but it makes the lamp heavier and costlier and for ordinary traveling purposes the reflector alone will concentrate the light sufficiently without getting undesirable effects in the bargain. The adjustment left to the purchaser of the headlight should be nothing more than moving the light source a little in or out with relation to the focus of the reflector. And in practice nothing more is usually expected of him. But it happens that the best obtainable adjustment, in a case of a poorly designed lamp, is not a satisfactory adjustment, giving rings, streaks or spots of stronger and weaker illumination, trying on the eyes and interfering with sharp discernment of objects. It is the art of the lamp designer to avoid these effects, while getting a maximum of illumination where it is wanted with a minimum of encumbrance and cost.

The principles governing this phase of the headlight subject are explained in a simple manner by Robida and make it clear why, for example, a lamp of moderate power and correctly constructed may give more comfort for night-driving than a more powerful lamp less scientifically designed.

It is the property of a parabolic mirror to reflect all light rays coming from the focus in a direction parallel with its axis, so that all these light rays form a solid cylinder. Thrown upon a screen or wall at right angles with the axis these rays consequently illuminate a circle of the same diameter as the face of the reflector.

When the light source is moved forward, as from the focus F to the point E in Fig. 1, the reflected rays will converge toward a certain point in the axis, and at this point E′ there will thus be produced an image of the light source. If not intercepted on an opaque substance at this point, they cross and continue in space, forming a light cone which appears to come from the location of E′.

In reality it is not strictly accurate that all the rays converge to exactly the same point in the axis, but they do converge to a very short line, forming part of the axis, and this small inaccuracy can be neglected, as it remains true that a lamp with its light source in front of the focus causes the rays to converge almost to a point where an image almost as brilliant as the light source itself is produced, and every grain of dust, every insect and every globule of vapor, in the case of a mist, which passes by this point is illuminated in a violent and disconcerting manner. If the point of convergence is far enough ahead — the light source being close to the focus, yet ahead of it—the image of the light may even be reflected back into the eyes of the driver from any brilliant object, such as some part of an automobile coming in the opposite direction, and the glare may blind him.

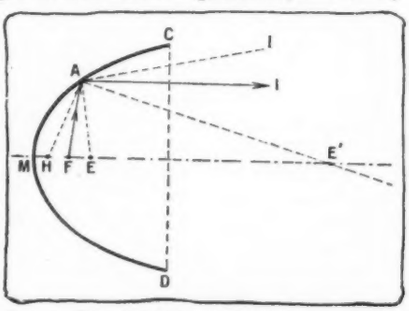


Fig. 1—Showing theory of parabolic reflector

The first principle for the design of a headlight, in which only the action of a reflector is depended upon for the desired light effects, is therefore that the light sources must be placed behind the focus of the parabola, as at H in Fig. 1. The reflected rays will then always diverge from the axis, like the line AI, being the reflection of the ray HA, and no image of the light source will be formed in front of the lamp.

The light sources which can be used in practice are not concentrated at a mathematical point, however, and for this reason some complications arise. In fact the filaments in incandescent lamps, whether they are shaped as coils, spirals or in zig-zag formation, have rather large dimensions, compared with the distance of the parabolic focus from the nearest point of the mirror. Fig. 2 illustrates the irregularities arising from this cause.

KH is the filament which is placed slightly behind the focus F. From each point of the filament rays issue which are reflected in the form of a cone, and the cones formed from points near K are more irregular than those formed from points nearer the axis of the mirror. In combination all the cones formed from individual points of the light source constitute a cone more irregular than any one of them, and the angle of divergence of this light cone issuing from the lamp as a whole depends upon the two factors: (1) the divergence of each elementary cone and (2) the divergence of the elementary cones among themselves. The latter element depends solely upon the size and shape of the light source, and cannot therefore be reduced below a certain practical minimum in each case.

Attempting a Searchlight Effect

If now it is considered desirable to obtain a light cone which does not spread much and, with this end in view, one makes arrangement to have the divergence of the elementary cones smaller than the divergence which can be realized for the light cone in its totality—as may be done by placing the light source very close to the focus, behind it—the elementary cones become separated at a certain distance ahead where the boundary lines of the slightly divergent elementary cones cross the more divergent boundary lines of the cones sent out from those points of the light source which are removed from the axis. If all the light is caught on a white wall there is in fact noticed upon the latter a large distorted image of the light source represented in the variations of light values on different portions of the wall, and in practice this discontinuity of the illumination at a certain distance ahead of the car shortens the actual reach of the headlight by creating confusion.

To avoid this effect it is necessary to place the light source so far back of the focus that the divergence of the light from any one point covers the divergence due to distance from the axis of some portions of the light source. The method of proceeding to obtain a suitable adjustment of a lamp which is designed well enough to admit of such an adjustment being made (that is, in which the dimensions of the light source and those of the reflector, as well as the angle of the parabola are so selected as to admit of the desired results), may be outlined as follows:

It is best to light the headlight in the daytime so as to avoid fatiguing the eyes. The lamp is then moved forward or backward until by looking into the reflector at a distance of several yards the whole face of it seems to be one mass of light. The filament is then very close to the focus, and no image of the light source is visible. If the filament is moved from this position well toward the back of the reflector, an actual image is soon seen to form far back of the mirror, apparently, and the latter no longer seems uniformly lighted.

Method of Adjusting

With the filament close to the focus the light is now projected upon a white wall. A more or less irregular illuminated spot is seen. The science of lamp makers consists largely in making the irregularities in the distribution of light over this area as inconspicuous as possible by the means before mentioned. Still they will be noticed to some degree with the adjustment as stated.

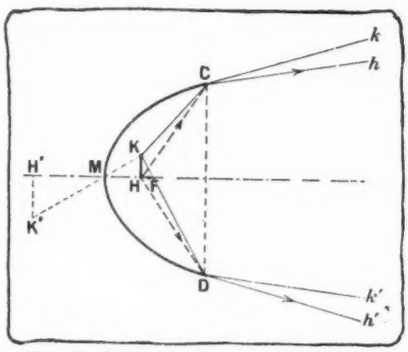


Fig. 2—Showing conflict of light rays from filament HK of relatively large dimensions. H' K' its magnified image.

But if the filament is moved backward a little—not as far back as to cause an image of the filament to be seen apparently at a distance behind the mirror, as before referred to—the irregularities on the wall disappear gradually and the light becomes more and more uniformly distributed. At first the illuminated area barely increases in size by this adjustment, because the elementary light cones are less divergent individually than in their relations to one another, but when the filament reaches a certain point in this backward movement of it, the divergence of the rays from each point in the light source finally becomes as great as the divergence due to the size of the filament, and from that moment, if the backward movement were continued the illuminated spot on the wall would grow rapidly in area while the light value at any one point of it would diminish. At this position the adjustment should therefore be stopped.

This is not the mode of adjustment giving the greatest penetration along the axis of the reflector, as the light cone is made divergent on purpose, but it gives the greatest regularity of the light throughout the area which receives light at all. And this is the preferable system, because it permits one to see objects at both sides of the road, puts less strain upon the automatic adjustment of the eyes to different degrees of illumination, enables one to discover more readily a vehicle coming out from a side road and makes it easier to pass by vehicles coming from the opposite direction.

If an adjustment such as described leads to a spread of the light which is really too great it is usually better to choose a smaller incandescent filament than to concentrate the light by a different adjustment. Both methods will give a less divergent cone of light, but the weaker lamp will give more acceptable results if the light from it is more uniform by reason of being more suitable for the shape and dimensions of the reflector.—From *Omnia*, July 23. (Author neglects the effect of using two headlights.—ED.)

New Type of Automatic Carbureter Easily Adjusted

IT MAY be doubtful if the carbureter represented in three sectional views in Fig. 3 is fully equal in its present form—especially with regard to its responsiveness to acceleration and retardation and in fuel economy—to the many excellent carbureters produced lately in all of the four principal countries of the automobile industry, Germany, France, England and the United States, but it is different from any other and may suggest new ideas along the line of progress.

The sections are taken along the planes AA, BB and CC. Owing to the peculiar, spiral shape of the air channel, the device has been called the *Turbinen-Vergaser*, or turbine carbureter. This shape and the lateral entrance for the additional air are supposed to contribute to the formation of a uniform gas mixture. The level of the fuel, which is indicated by a dotted line, is only very slightly below the mouth of the two jets *b* and *f*, and these are at the same level as the lower edge of the throttle valve. The small jet *f* is closed by means of a ball *a* unless the throttle is almost closed, when a small pin *c* upon the edge of the valve pushes the ball to one side and releases the flow of fuel through *f*. The air needed for starting and still-running is adduced through the opening *m*. When the throttle is opened more, *f* is obstructed by the ball going back into the position in which it is held more and more accurately over the mouth of *f*, until the pin upon the valve finally is withdrawn completely and allows the ball to shut *f* entirely. "With increasing motor speed the main jet *b* now begins at once to work," says the German describer at this point, falling into the common error of neglecting to state how the motor reaches the increased speed by the action of the throttle valve upon the carbureter. It is not plain that the acceleration is in fact accomplished by any other means than ceasing to obstruct the air passage and relying upon the motor speed to be kept up by the momentum of the flywheel and of the vehicle until the larger flow of air has taken effect upon the main jet—which is the method now largely discarded as precarious in other modern carbureters, giving fitful and unreliable accelerations. The describer says however that there is created at once "by the increasing motor speed" a correspondingly increased suction by which the hinged cover *h*, which is held down over the air port by means of a weight which can be secured at different points upon a lever arm, is raised and admits a current of air to enter transversely of the fuel current from jet *b*. The system of an adjustable weight to hold the airhole cover down lends itself to a facile regulation of the gas mixture.

The sectional view along the plane BB, to the right in Fig. 3, shows the adjustment screws by which the amount of fuel passing through the two jets may be regulated. The channels through the jets are large, so as to be adaptable to different motor sizes by this adjustment only. Jet *b* has a lateral bore to the air current.—*Der Motorwagen*, July 20.

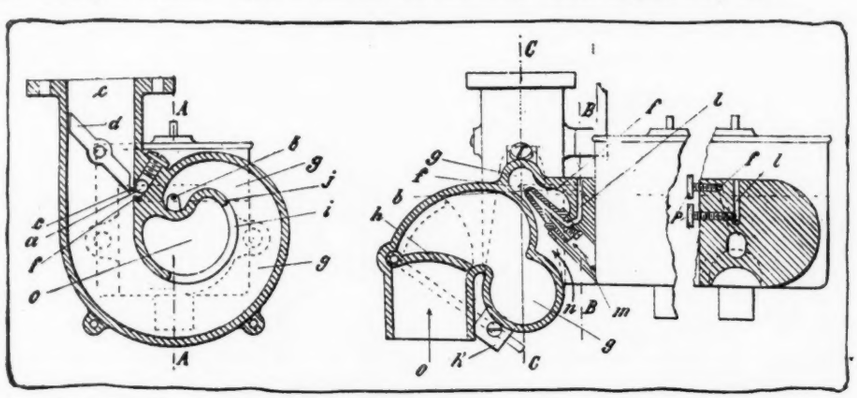


Fig. 3—Three sectional views of "turbine" carbureter; h' the adjustable weight

New Rotary Motor Has Axial Cylinders

Macomber Air-Cooled Rotary Motor Simple and Free from Vibration—Manifold Used as Muffler —Built for Cyclecars and Large Cars

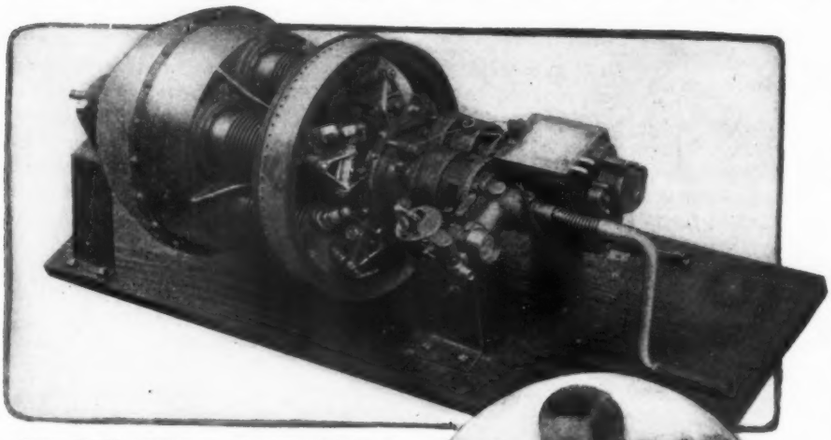


Fig. 2—Macomber motor, showing arrangement of cylinders and valve mechanism. Note ring type, exhaust manifold with holes to expel the burnt gases

Fig. 3—The cyclecar motor

ECONOMY, simplicity and freedom from vibration are the salient features of a new air-cooled, rotary motor, Figs. 1, 2 and 3, manufactured by the Macomber Motors Co., Los Angeles, Cal. This motor differs from the ordinary construction in that it has its cylinders arranged parallel to the axis of rotation instead of radially. It is built in five and six-cylinder sizes, the former being an 11-horsepower design for cyclecars and the latter a 50-horsepower machine for larger cars. The two designs are practically identical except in size and, therefore, only the smaller one will be described in detail.

Referring to Fig. 1, it will be noted that the part of the mechanism that remains stationary is blacked in. No crankshaft is employed, but the connecting-rods are attached to a plate that is set at an angle of about 25 degrees to the axis of the crankshaft. The connecting-rods are fastened to this plate by means of ball and socket joints and similar joints connect them to the pistons.

Reciprocation of the pistons is accomplished by the rotation of this plate. When the motor is running this plate is carried around with the cylinders and any given point on it moves the length of the stroke in one-half a revolution.

Overhead Valves Employed

Overhead valves are used, the intake valves being on the inside and taking the charge from a centrally located manifold. The exhaust gases pass directly from the valves to a circular exhaust header, Fig. 2, the outer circumference of which has a series of small holes from which the gas makes its way to the atmosphere.

A single rocker serves to operate the intake and exhaust valves to each cylinder; this is distinctly shown in Fig. 2. It will also be noted that the rocker arms are a heavy yoked construction.

A camshaft is not used, the valves being opened and closed by the movement of the inner ends of the rocker arms in a cam-like groove. The rocker ends are provided with rollers to reduce wear. Rocking one of the arms in one direction opens the intake valve and in the other the exhaust valve.

The starting crank is attached to the valve end of the motor. The carbureter is situated at one side and the magneto at the other.

The oiling is by a combination splash and circulating system. Gravity carries the oil from an automatic oiler on

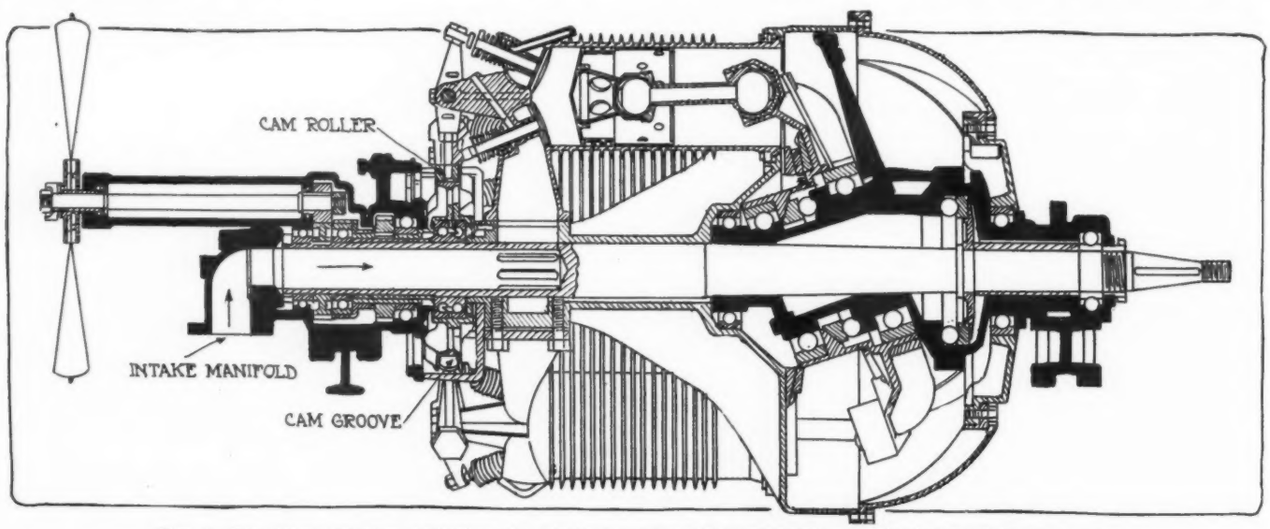


Fig. 1—The black portion indicates the stationary part of the mechanism. The intake is in the center

the outside of the motor to the center and centrifugal force throws it around the interior.

The large motor has six cylinders, 4.25 by 5.5 inches, and has a maximum speed of 1,500 revolutions per minute. The valves have a diameter of 2 1-16 inch and a lift of 5-16, and are made of nickel steel. The valve timing is as follows: Intake opens 10 degrees after upper dead center and closes 20 degrees after the end of the stroke; exhaust valve opens 45 degrees before lower dead center and closes 5 degrees after upper dead center.

On the 11-horsepower motor the bore is 2.375 inches and the stroke 3 inches. The diameter over all is 12 inches, and the length 24 inches.

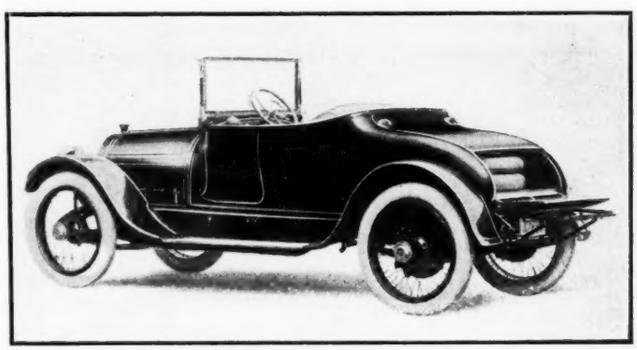
It is stated that these motors are remarkably free from vibration and that the economy is high, the smaller motor being capable of driving a machine over 60 miles on a gallon of gasoline, while the larger one will do 30.

Worthy of special note is the fact that while the ordinary motor with radial cylinders suffers from over-lubrication due to the oil being forced up into the combustion chamber by centrifugal force, this motor by the parallel arrangement of its cylinders has no such difficulty.

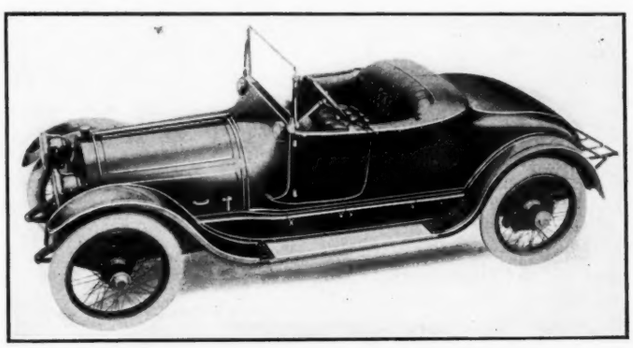
1915 Stevens Runabout Has Disappearing Top

New Cars Appear in One Model—Slight Power Increase—Cars Characterized by Graceful Bodies—Spare Tires Concealed on Runabout

STEVENS-DURYEA cars for 1915 follow very closely the general lines of the present product, although designated by only one model number, there are really two chassis, and in both of these there has been an increase of 1-16 inch in bore of the engine, so that the engine on the roadster chassis is now 4 3-8 by 5 1-2, and that on the touring chassis is 4 7-16 by 5 1-2. The roadster wheelbase is 131 inches and the touring wheelbase 138 inches, which is the same as that of the 1914 product. In other respects the chassis are the same as that of the earlier models, except that left drive is employed instead of the right drive, and that electric starting is fitted as stock equipment. The feature of the new line is a new roadster, which is arranged so that the top disappears completely inside of the body. The neat, attractive appearance resulting may be seen in the lower illustration at the right of the page.



Three-quarter rear view of new Stevens-Duryea runabout with disappearing top and compartment at the rear for spare tires



View of new Stevens runabout showing the method of covering the opening into which the top disappears

Disappearing Top

Continuous streamlines, characteristic of Stevens-Duryea bodies, have been carried out in this new type, the deck sloping gracefully from the back of the seat and rounded at the rear. The gasoline tank is entirely inclosed, and provision also is made for carrying two tires mounted on rims, or one wire wheel mounted and extra tire, under the deck, completely inclosed and out of view. The top is supported by mechanical means by neat but rigid joints, which cause it always to follow a certain path in folding into and being withdrawn from the body; it is self-supporting and when up requires no braces of any kind, being rigidly fastened to the windshield supports in the same manner as in the Stevens-Duryea touring cars. When the top is folded the concealing compartment is completely covered by the upholstery. The opening is also covered by the upholstery when the top is in use, thus making a neat, finished appearance, in either position, as well as affording full protection to the top from dust and dirt when concealed.

New Auxiliary Seat

A new type of auxiliary seat is employed in the seven-passenger touring cars. Each seat has one upholstered arm on the inner side, the upholstered arm rail providing a rest on the outer side. The construction allows for folding backwards and sidewise against the side of the tonneau, or when in this position can be tipped forward in front of the entrance, thus removing these extra seats entirely out of the way of passengers occupying the rear seat and obscuring them from view of those outside of the car.

In addition to the complete line of open and inclosed cars as marketed by the Stevens-Duryea company during the season of 1914, the company is offering a seven-passenger landaulet, built on 139-inch wheelbase chassis.

In the electric ignition system the Stevens-Duryea company has retained the two independent Bosch high-tension magneto and battery systems of ignition with synchronous coil, high-tension timer distributer and instrument-board switch. Two sets of spark plugs are furnished which, with the independent systems of ignition, eliminate chances of trouble in this connection.

Unit Power Plant Continued

Stevens-Duryea unit power plant, suspended at three points, continues to be a feature of these cars as it has been for many years. The disk clutch, progressive three-speed gearset, floating axle and 37 by 4 1-2-inch tires are continued.

M. A. M. Has Efficient Traffic Dept.

Audits and Corrects Freight Bills of Members, Saving Material Sums—Consults with Shippers and Railroad Representatives

By Alfred P. Sloan, Jr.,
Secretary and Assistant Manager

A FEW years ago, realizing the large amount of unnecessary drain upon manufacturers—a drain that was going into the coffers of railroads, not because of dishonest intent, but rather due to existing conditions—a traffic service was inaugurated by the Motor and Accessory Manufacturers Assn., which numbers in its membership 262 of the leading American makers of automobile parts and accessories and represents a combined capital of $440,000,000. Since that time this department has been developed to a really remarkable degree of efficiency, and through its co-operative workings thousands of dollars have been saved for members of the association who have made use of this department. Indeed, many of the members have found that the amount of refunds from railroads on incorrect freight bills, after having been audited and claims registered by the Traffic Department, have more than paid for the annual fee for membership in the association. When one stops to consider that one member recovered the sum of $870.72 on his claims of a few months, it will be seen at once that the above statement is not exaggeration.

Auditing Freight Bills

The matter of auditing freight bills, while an essential one, is only one of the important branches of the work of the Traffic Department. Any member of the association may send all of his freight bills to the department regardless of the number of bills or the amounts involved, and each separate shipment will be carefully checked by the experts employed by the department to ascertain if the road or steamboat line has made an overcharge. The law requires that the correct published rate be applied on all shipments even though railroads have by error quoted other figures. Naturally in the course of the really intricate matter of routing shipments from point to point over several different roads, the human equation enters into the case. No matter how experienced the one in charge of the shipping department may be, his knowledge of freight rates is bound to be limited and certainly the knowledge obtained in a cooperative way by the Traffic Department through having handled to date more than 100,000 freight bills, dealing with every section of the country, is superior to any one man's knowledge.

Some idea of the scope of the work of this department and how it is appreciated by members is made evident by a few comparative statistics. The first year it was in operation, 1911-1912, there were forty-three members who made use of the department. During the fiscal year July 1st, 1913, to June 30, 1914, the department was used by 136 members a total of 803 times. During that period 51,690 freight bills were audited. Out of the number of freight bills audited a very material percentage were found in error and warranting traffic claims being entered. Incidentally, it may be mentioned that the Traffic Department enters these claims with the railroads and upon collection turns the amount over to the members. Recognition of the value of Traffic Department is shown by the fact that in the year 1913 there was an increase of more than 60 per cent. over 1912 in the number of times the department was used by members, and the number of claims was exactly doubled.

Checking results from a dollars-and-cents standpoint, the total amount of claims entered the past year was $2,973.13, and with thirty-three members involved meant an average refund of $90, just $40 more than the annual membership fee. Of the above-mentioned sum of $2,973.13 for claims entered up to the close of the fiscal year, $2,230.82 of this amount had been paid, which figures demonstrate the fact that claims entered by the Traffic Department are not mere idle claims, but result in material return.

The Traffic Department of the Motor and Accessory Manufacturers is under the direct supervision of J. S. Marvin, who is general Traffic Manager of the National Automobile Chamber of Commerce and is unquestionably one of the best informed men in his line in the country.

Consulting on Shippers' Rights

But aside from the auditing of freight bills the most important feature of the department of far-reaching benefit, one which is not explainable in dollars and cents, is the matter of consultation on shippers' rights in traffic matters of any character. If a member wishes to be advised how his particular article or commodity should be packed, described or billed to secure the benefit of the lowest transportation charge, he can secure information resulting in great saving and this saving is impossible to estimate. Such entries may result in the department securing a reclassification of the article in event that there appears to be an opportunity, and here again an immense saving for the manufacturer results. The extent of this branch of the work is indicated by the fact that during the past year 3,500 bulletins dealing with fifty-two subjects relating to the Traffic Department have been issued to members, while the previous year nearly 6,000 bulletins dealt with sixty-eight subjects. These related to specific subjects or points involved in shipping, and although it has been shown in a general way from the start how members may use the department, it has taken time for members to realize the cooperative service that can be rendered. Bulletins show the actual occurrences, rulings and points decided.

In Touch with Railroads

At all the meetings of the various railroad rate-making committees the Traffic Department is represented and is advised in advance of the subjects to be considered at these meetings. To illustrate: among the items recently considered by railroads regarding which the department has been able to render assistance, are automobile engine and gear parts, radiators, speed indicators and attachments, bodies, ball bearings, horns, tires, lubricators, grease cups, mufflers, camshafts, etc. If ratings or shipping requirements are to be taken up, the manufacturers of the machines or parts involved can be informed and their interests represented. Changes made in the published rate tariffs and classifications which affect transportation charges are kept before the membership so that the shipping departments of the factories may take advantage of the most favorable rates.

Ruetschi Gearset Keeps Perpetual Mesh

Employs Combination of Planetary and Sliding Principles—Impossible To Clash Gears

A THREE-SPEED gearbox designed to furnish non-clashing changes to any speed has been brought out by the Motor Engineering Co., Cleveland, O. It secures the direct driving features through a combination of the planetary and sliding gearset principles. The advantages claimed for this system of gearing, which is the invention of Arnold Ruetschi, of Cleveland, is that it is impossible to clash the gears when changing from one speed to another and no gear changing is necessary on a hill because the gear can be selected before it is needed and when it is required a movement of the foot in depressing or releasing the clutch pedal throws the desired gear into operation.

Has Two Principal Elements

A sectional view of the gearbox is given in the accompanying illustration. As the gearbox stands it is in neutral position, and as will be seen is composed of two principal elements; namely, the gearbox proper which is bolted to the engine crankcase as in any unit system, and the rotating housing which carries two countershafts one of which is shown in the sectional illustration. In the drawing the exterior housing is denoted by A, the rotating housing by D and the countershaft C.

When in high speed the rotating housing B rotates solidly with the entire drive giving the direct high speed, but in first and second speeds and reverse this movable housing is stationary. The method of locking the housing against revolving is by means of the clutch D. When this engages with the solid anchored frame A, it is incapable of revolving. On the other hand, when the clutch is engaged with the motor member it is rotated by the motor and revolves as a unit.

Casing Revolves as Unit

In high, low and reverse speeds the gear clutch E is in mesh with the internal gear F, and in intermediate speed the gear clutch E is in mesh with the internal gear G. High speed may be also attained with the gear clutch E in mesh with G because the entire revolving casing is moving as a unit and the position of E is immaterial.

Tracing the drive through the gearbox, it will be seen that on high speed it is transmitted to the clutch member D, which is free of the anchored member A, passing through the solid casing B and thence to the rear axle. That is, the entire gearbox moves as a solid part of the shaft and there is no motion in the gears and countershafts.

When in intermediate speed the drive passes through the main shaft H and thence by means of the shaft clutch E to the gear G. This in turn meshes with the gear J on the countershaft C, giving a planetary motion to the gear on the countershaft which follows around carrying with it the rotating housing which transmits the drive.

During this time the clutch D has been moved backward into engagement with the stationary clutch on the housing A which brings the rotating gear case to rest. The low speed is then secured through the two countershafts, C. After bringing the gearcase to rest the drive is no longer planetary but becomes the same as in the sliding gear transmission. This gives only a straight torsion on the driven shaft.

To change from intermediate to high speed the clutch pedal which controls the clutch D is released and the clutch is brought into engagement with the flywheel member, thus locking the whole unit together, giving high speed.

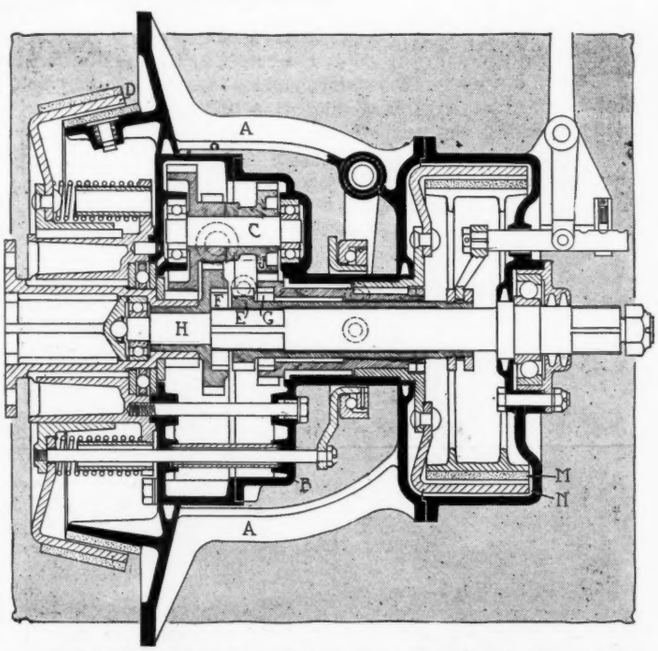
Reverse is obtained by having clutch D in neutral position and applying the brake M on the drum N which brings to rest the idler gear G. The countershafts C then revolve backwards with a planetary motion, carrying the idler gear F along with them at a reduction given by the gear ratio.

When traveling along on high speed if it is desired to be ready to shift into second it is only necessary to mesh the gear E with G and leave it in that position until ready to make the change. Then, no matter at what speed the car is traveling, the change can be made by simply depressing the clutch pedal which will lock the rotative housing, bringing it gradually to rest with a smooth cone clutch action. As soon as the housing has become secured owing to the pressure on the clutch the second speed comes into the action. In this manner there is no meshing of revolving gears as the gears are set before the change is made. The same principle is involved in using the low speed except that the gear E is meshed with F instead of G.

Ball Bearings Used

Entire gearbox is carried on ball bearings and weighs for a 12-18 horsepower unit complete with pedals, clutches, levers and brake, 50 pounds. The gear ratio supplied on low speed to the gearbox alone is 4 to 1. On the second speed 2.25 to 1, and on direct drive with all gears locked it is 1 to 1. The reverse ratio is 3.8 to 1. The gearbox is applicable to any size of car and is claimed to be of particular advantage to trucks where a large amount of shifting can be done without clashing the gears.

By the liberal use of aluminum the gearcase can be made of exceptionally light construction. It is exceedingly flexible and if desired reverse could be thrown in while the car is traveling ahead at high speed.



Section through the Ruetschi gearbox. The drive is taken either through the clutch at D, which in turn rotates the casing B and transmits the drive solidly to the rear axle, or the drive is taken through the gears F, E or G with the clutch D held firmly by engagement wtih the solid member A. The advantage claimed for this system of gearing is that it is impossible to clash the gears when changing from one speed to another and that no gear changing is necessary on a hill because the gear can be selected before it is needed and then brought into use by pressure on the clutch pedal

1915 Hupmobile Has Left Drive

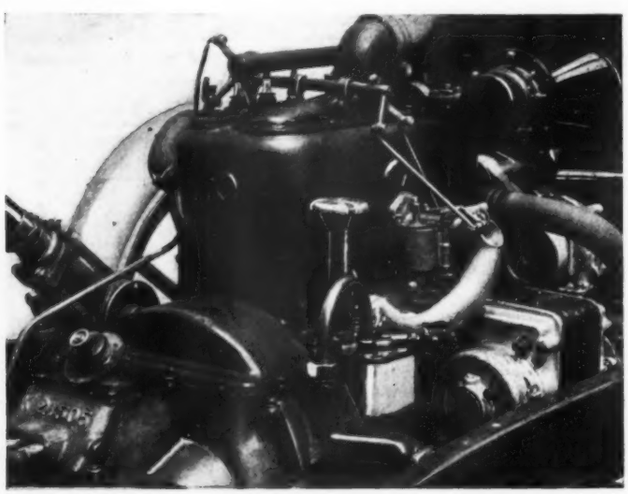
Car Is Entirely Re-Designed—Wheelbase 13 Inches Longer—Motor Is Larger —Streamline Body

UNDER the name of Model K the Hupp Motor Car Co., of Detroit, Mich., has brought out an entirely re-designed car for the 1915 season. It is a larger and more powerful car than the Hupmobile of last year and there is hardly a feature throughout its construction that is unaltered.

Left Drive and Center Control

To take care of the larger power plant and bigger body the wheelbase has been changed from 106 inches to 119 inches, and in making this chassis change several features that were formerly peculiar to Hupp practice have been radically reconstructed. Left drive with center control is one of these innovations and another which marks a difference between the car of today and the previous ones of Hupp design is the use of semi-elliptic underslung rear springs in place of the former cross rear springs. In changing the suspension the entire framework of the chassis is new and this in turn has been the cause of alterations in the linkages, brakes and control members.

While many of the fundamental features of the motor design remain the same, the bore has been increased 1-8 inch. The water jackets are larger and the valve diameters have been increased. The connecting-rods are longer, all the bearings larger, with wider ports and an entire change in the manifold design. The carbureting system is also new in that it now preheats the air by means of exhaust heat. While the Zenith carbureter is still employed, it is now the horizontal type instead of the vertical and is now a 1.25-inch size in place of the 1-inch formerly used.



Right rear of Hupmobile motor, showing Westinghouse single unit lighting and starting equipment and also new Zenith carbureter. Note linkage over cylinders for flap air valve on carbureter

Three-quarter front view of 1915 Hupmobile roadster

Some Hupmobile Refinements

- Larger Body of Streamline Type
- Wheelbase Increased Thirteen Inches
- Left Drive with Center Control
- Semi-Elliptic Springs in Rear
- Single Unit Electrical System
- Horizontal Type Carbureter
- Hexagonal Cell Radiator
- Motor Bore Increased 1-8-inch
- Automatic Spark Advance System
- Unusually Complete Equipment

Single Unit Electrical System

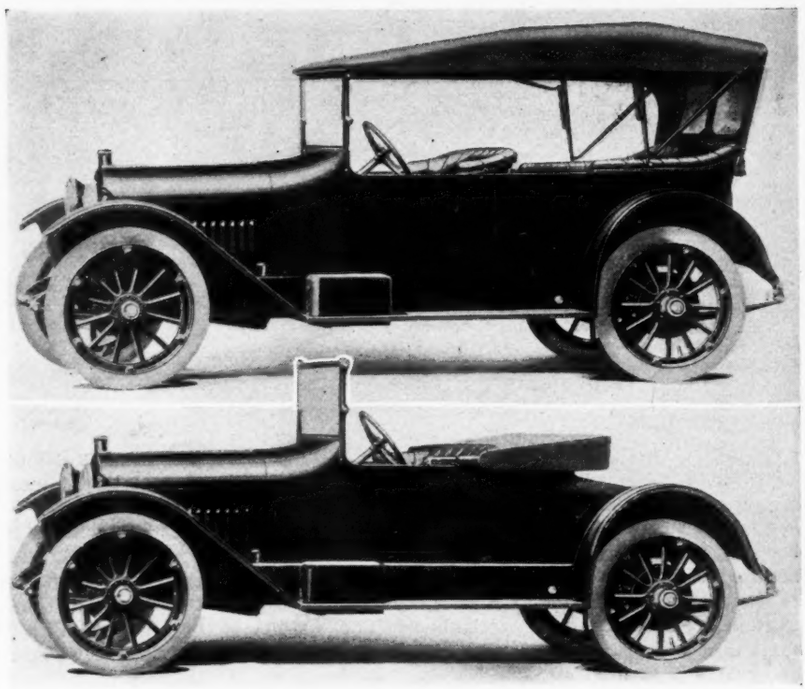
The electrical equipment of the car has also been entirely re-designed. As in its predecessor, the new car employs the Westinghouse electric lighting and starting system, but instead of using the double unit system the cranking motor and the lighting generator are now combined into a single unit. Instead of using magneto ignition, an Atwater Kent distributer driven from a vertical shaft and supplied with automatic advance has been fitted. With the application of the new distributer many other exterior fittings of the motor have been altered. There is a new fan bracket which maintains a continuous tension on the fan belt by means of a coil spring.

Gearbox Is More Accessible

In rearranging the motor, the drive of the camshaft has been moved from the rear to the forward end. The oil filler has been moved back to accommodate the new position of the carbureter and, while the oiling system itself has not been altered so far as the motor is concerned, it no longer takes care of the gearbox. The object has been to rearrange it so that heavier oil can be employed for a gear lubricant. Instead of the gearbox being a unit with the crankcase it is now bolted on separately, making a more accessible job as far as reaching the gears in the gearbox is concerned. Large cover plates are now placed over the gearbox and clutch housing and the oil filler opening projects through the floorboards of the car so that the driver may refill the gearbox

without lifting these boards, but by merely picking up the cover of the floorboards.

The clutch is the same in principle as in the last model, but has been turned completely around, the purpose being to put the thrust drag on the gearbox rather than on the motor when slipping the clutch. The diameter of the clutch remains the same at 13 inches but the number of plates in the clutch has been increased by four. There are now thirteen. Just back of the clutch there is a new chassis frame member extending transversely, which acts as a stiffener and which carries the pedal shaft for the brakes and clutch.



Above—1915 Hupmobile touring car. Note absence of side lights. Note also one-man top and ventilating windshield. Lower—New Hupmobile roadster showing streamline design. Note underslung semi-elliptic rear springs

Two Universals Instead of One

While the shaft system of drive is practically the same, there are now two universal joints, one at either end of the shaft, whereas in a former model there was but one. The rear universal which has been added is a cross type. The propeller shaft is now tubular and the lubricant from the forward universal is allowed to run back through the hollow shaft to the rear universal. There are now no radius rods or torque members, both the drive and torque being taken through the new springs.

The entire rear axle is new. In former Hupp cars when it was desired to reach the differential it was necessary to remove the bolts from the vertically split housing and to take the entire housing apart. There is now an exceptionally large circular cover plate which when removed exposes the entire differential and drive mechanism. The ratio of the final drive has also been altered and is now 4.25 to 1. The front axle is also entirely new and is now the Elliot type with a knuckle which is designed to give a castor effect to the front wheels.

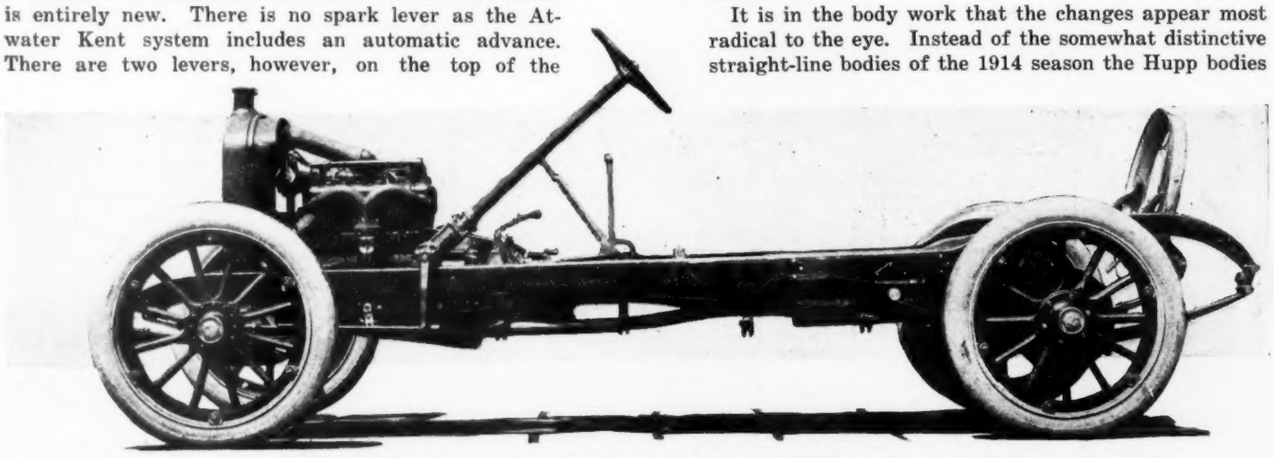
In altering the spring design an exceptional amount of attention has been given to the placing of grease cups on all spring connections. There is also an inter-leaf oiling scheme which is new. In the extremity of each leaf there is a spoon-shaped depression which is packed with graphite. This scheme has been originated by the Detroit Steel Products Co. and by its use the lubricant need be inserted between the spring leaves but once in a season.

The same steering gear is used as in the previous model but the steering wheel is now 18 inches, whereas it was formerly 17 inches. The arrangement of levers on the top of the steering wheel and the linkage in transmitting the motion to the throttle and air control of the carbureter is entirely new. There is no spark lever as the Atwater Kent system includes an automatic advance. There are two levers, however, on the top of the steering post. One of these is the ordinary hand throttle lever and the other operates in conjunction with a flap air valve on the new Zenith carbureter. When moved over in one direction it cuts off the entire air supply of the carbureter, furnishing the rich mixture required for easy starting. When moved to the other extremity it opens to the outside air, permitting of extra air for high-speed work.

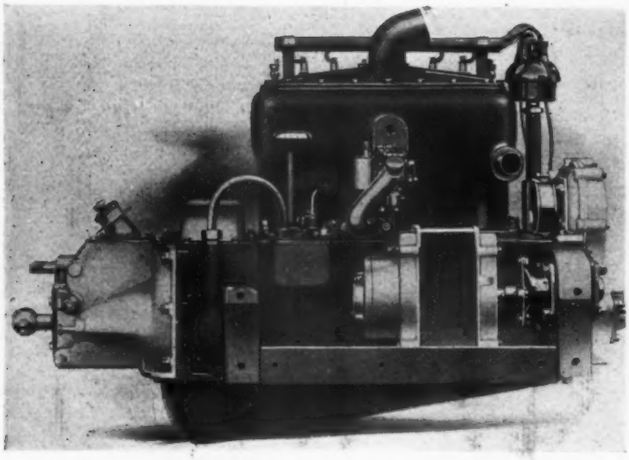
The wheels are larger than they were last year. The tires are now 34 by 4 inches, whereas on the preceding model they were 33 by 4. The tire carriers are the same on the touring car, but on the roadster they are now carried under the rear deck.

Various little details increasing the comfort in the operation of the car have been made a subject of study. An example of this is in the pedals, which are now adjustable and which are provided with exceptionally large foot pads. There is now also a side support for the foot in operating the accelerator pedal. Owing to the reversal of the clutch the pedal operation is fully 50 per cent. easier than it was in the former model.

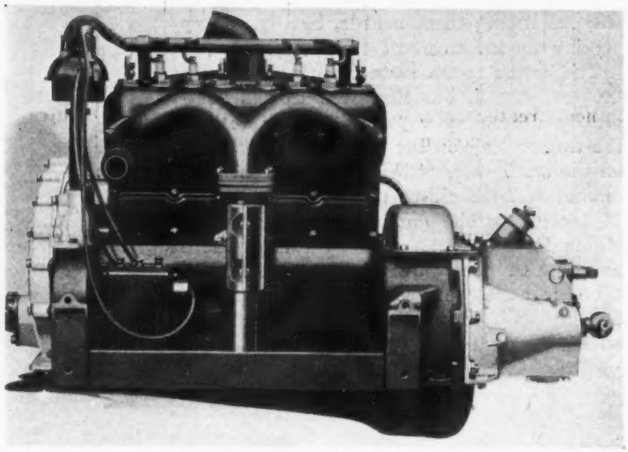
It is in the body work that the changes appear most radical to the eye. Instead of the somewhat distinctive straight-line bodies of the 1914 season the Hupp bodies



Side elevation of 1915 Hupmobile chassis, showing left drive and center control, and also new tire carrier at rear



Intake side of 1915 Hupmobile motor. Note mounting of Westinghouse unit and horizontal type Zenith carbureter



Exhaust side of new Hupmobile motor, showing mounting of Atwater Kent system with automatic advance

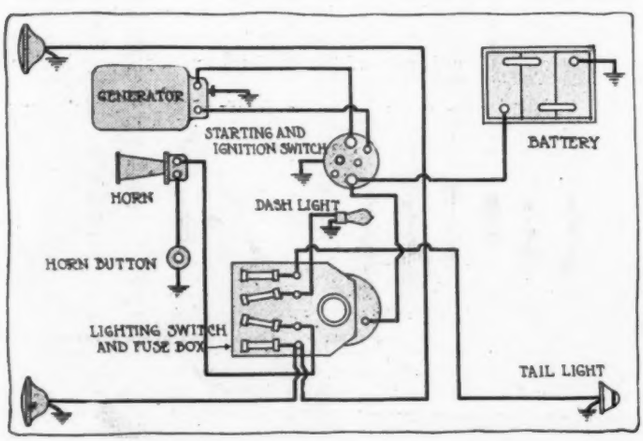
are now a full molded streamline construction. The sloping hood and cowl form a continuous curve which is not terminated at any point on the body but which is swept directly to the rear end of the car. A new radiator which makes a more fitting entrance of the streamline form and which at the same time gives a gain in capacity of 2.5 gallons, by the use of hexagonal in place of square cells, has been fitted.

Two standard types of body will be furnished, the roadster and touring car. The price of each is $1,200, fully equipped. The standard colors are blue-black bodies with maroon running gear and nickel trimmed. The cars come fully equipped with a new design of one man top, and a new type of rain vision windshield.

Motor Is More Powerful

The power plant of the Hupmobile is a four-cylinder, 3.375 by 5.5-inch motor, with the cylinders cast in a single block. The increase in piston displacement on this new motor has been from 182.5 cubic inches to 196.8. The cylinders are still offset .625 inch. This motor has a compression of 75 pounds gauge. Pistons are gray iron and carry three diagonally split rings. The piston pins are of steel hardened and ground and clamped in the connecting rods, turning in the bearings formed by the piston bosses. The bearing surface provided here is .875 inch in diameter and .175 inch in length. The piston pins are hollow.

Connecting-rods are drop forged, heat-treated, acid open-hearth steel. The bearing caps are fastened by 4.375-inch nickel-steel bolts, secured by cotter pins. The crankshaft is a 40-50 carbon open-hearth steel. All the bearing surfaces are ground and the three bearings are of generous length.



Wiring diagram of the electrical system on the 1915 Hupmobile

The front bearing is 2.5 inches long and 1 9-16-inch diameter, the center bearing 2 inches long by 1.625 inches diameter and the rear 3 inches long by 1 11-16 inches diameter. All the crankshaft bearings carry phosphor bronze bushings lined with babbitt, machined and reamed in place with a final hand fitting. The bearing bushings are split and can be adjusted by removing the pan on the bottom of the crankcase. The crankcase is a modified barrel type.

Adjustable Silent Chain

The camshaft is driven by Coventry silent chain at the front end of the motor. It can be adjusted for tension without removing the chain cover. The camshaft is also carried on three phosphor bronze bearings, the front bearing being 2 1-16 inches in length and diameter, the center bearing 1.375 inches long and 2 inches diameter and the rear bearing 1.375 inches long and 1 15-16 inches in diameter. The valves have a clear diameter of 1.15 inches. They have 45-degree seats and are forged in one piece from tool steel that will remain hard at red heat. The Hupp engineers claim that this type of valve will seldom if ever require regrinding. In place of the cover plates which were formerly used over the valves there are now screw plugs. The followers which are actuated by the cam are mushrooms. The chamber which contains the valve springs is inclosed within an oil-tight cover so that the contact between the valves and the tappets takes place within an oil bath.

The oil is circulated by the flywheel. The flywheel rim is close to the bottom of the oil pan at its deeper part and the oil that adheres to the flywheel is carried around with it and thrown with considerable pressure, due to the centrifugal force of the flywheel, into a tube from which it is carried to the different working parts of the motor. The face of the flywheel in the new motor is very much wider than that of the previous model and hence a larger volume of oil is forced through a pipe of the same diameter, increasing the pressure and giving much better lubrication at high motor speed. This year the oil leads to the cylinders have been done away with, as experiments have shown that sufficient oil from the cylinders is thrown from the crank-end bearings in the form of mist.

Clutch Action Is Reversed

As mentioned, the clutch acts in the exact opposite direction from that used on the former model. That is, the friction on the clutch thrust is taken by a bearing in the gearbox instead of the motor. The thirteen disks are of hardened saw steel 13 inches outside diameter and 1-16 inch thick.

Outside of separating the gearbox from the engine, it remains the same as in the previous car. It is a selective

sliding type furnishing three forward speeds. The gears are 6-8 pitch with .75-inch face. The small gears are electric nickel-steel and the large gears acid open-hearth. The gears are heat-treated or case-hardened, according to the requirements of their carbon content. The bearings of the gearbox are annular balls and the front bearing, which is made of extra large diameter, not only carries the gear load but also is the bearing that takes the thrust of the clutch. This is a new feature in this model. The diameter of the gear shafts is 1.25 inches and they operate on four integral keys. The jackshaft is 1.25 inches in diameter. Shifting is accomplished by shifter forks operating on sliding shafts. This year the Hupp gears are run in heavy grease, whereas in all former cars they were oiled by a cylinder lubricant.

Rear Axle Construction Accessible

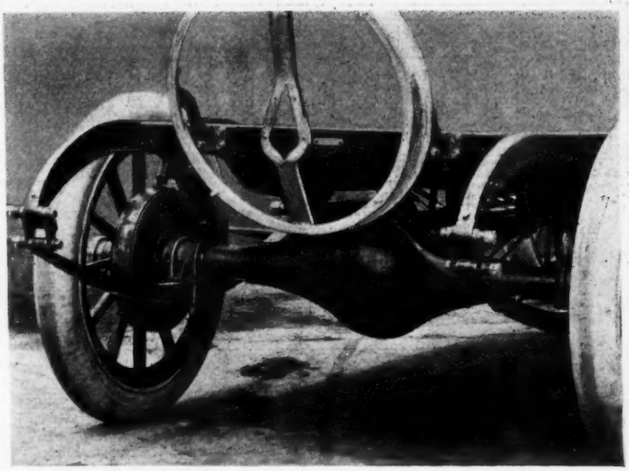
The rear axle is a floating design. Either of the axle shafts may be withdrawn from the housing without jacking up the wheel. The casing is of pressed steel with the gears and differential mounted in a malleable iron carrier. The differential is a bevel type running on annular ball bearings. It has four pinions. The gears are 6 pitch with .75-inch face. In adjusting any of the mechanism of the rear axle an accessible arrangement has been provided by means of which either the entire differential, together with the bevel pinion and gear or the large gear in the differential may be removed as a unit.

In re-designing the axle a new exterior appearance is given by the use of hub caps instead of the flat plate on the previous model, especially in combination with larger wheels and the altered rear spring design. Artillery type wheels are used with twelve 1.5-inch spokes.

The front springs are 37 by 1.75 inches, which is 3 inches longer than in the former Hupmobile and the new semi-elliptic rear springs are 52 by 2 inches in length and are shackled to an up-swept portion of the main frame.

Equipment Is Unusually Complete

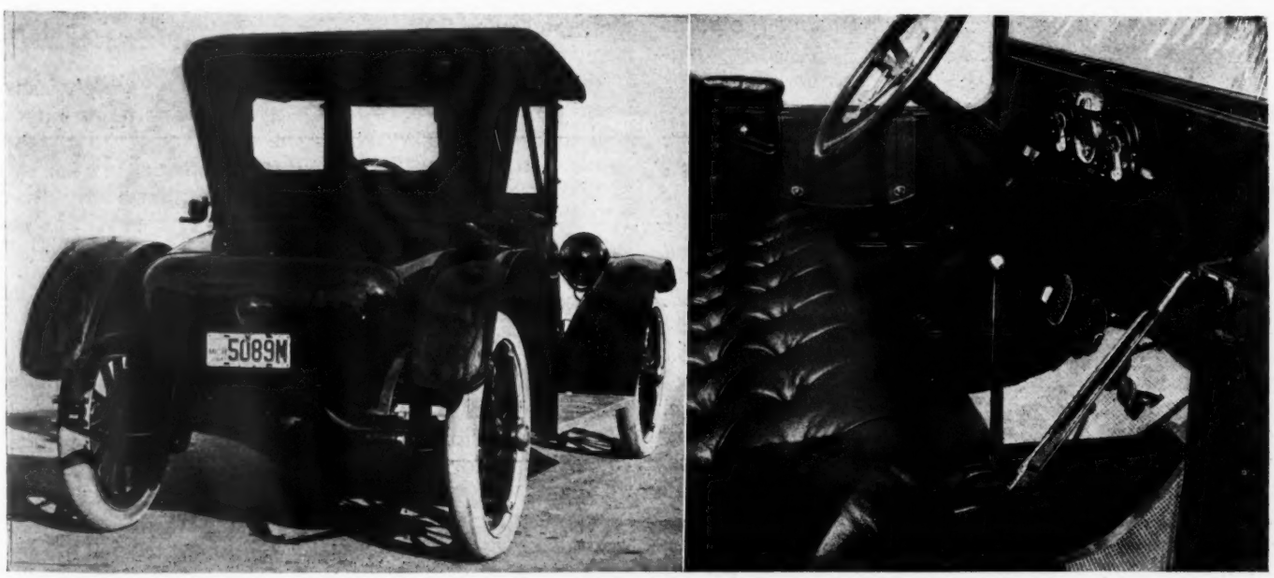
The equipment of the car is exceptionally complete this season, and in lighting and starting has been re-designed. It is the Westinghouse 12-volt type, 12 volts being used both for starting and in each of the lamps. Non-glaring headlights, in which the upper part of the front lens is corrugated, are now employed. The tail light has another exclusive feature in that it illuminates the road directly behind the car.



Rear construction of new Hupmobile, showing underslung semi-elliptic rear springs and bracket tire carrier

The electric starter is at the front right end of the motor and is connected directly by silent chain, giving a ratio of 2.64 to 1 to the crankshaft. Turning a switch lever on the dash starts the engine and at the same time closes the ignition circuit. As soon as the speed increases to a point where the car would be traveling 9 miles an hour on high gear, the electrical unit becomes a generator and starts charging the battery. At about 18 miles per hour the maximum charging rate of 8 amperes at 14 volts is reached. The motor can never stall for, should it cease to operate, merely depressing the clutch pedal will cause it to be started again. The timer for the Atwater Kent system is driven by spiral gears from the front end of the camshaft. The current is taken from the storage battery and operates at 12 volts.

The Westinghouse system is now included as stock equipment on all cars. There are also the headlight dimmers, license brackets, rain vision windshield, silk mohair top, speedometer, robe rail, foot rail and cocoa mat included with the car. The rims are demountable and one extra rim and tire carrier is furnished. The weight of the touring car when fully equipped and with the tanks empty is 2,650 pounds.



Left—Rear view of new Hupmobile roadster, showing tail light and license bracket mounted in the center. Right—Dash view, showing instrument board. Left—Lighting switch; center, speedometer; right, starting and ignition switch. All switches are controlled by Yale lock. Note pads on pedals

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A Rift in the Stormcloud

ENGLISH manufacturers are finding the supplies from Europe for building automobiles cut off and already they have started conserving stocks of parts for commercial vehicles that may be needed in the war. They find that the great factories of Belgium that have been supplying forgings, castings, axles, gearsets and numerous other parts, are closed because of the war.

This is America's opportunity. England can secure from this country many of these parts that she has hitherto looked to Belgium, France and Germany for. The possibility of this demand is the one rift in the overcast skies that have so suddenly clouded the automobile world. Motor cars are being needed for the war and will continue to be needed. The government has taken over some of the largest German factories. The Belgian government took over one or two of its largest car factories the moment war was declared. The same is true in France. There is little hope for America to sell supplies and completed parts to Germany, Belgium or France, but the opportunity for doing business in England is brighter. It is worth a good honest effort. Business done with England now under the stress of war conditions may well, and honorably, furnish an introduction for the American products which will redound to the permanent advantage of our industry.

Eight Cylinders

IT is more than possible that a new factor has entered into what has become known as The War of the Cylinders in that the eight-cylinder motor, which up to the present has been largely confined to the output of one manufacturer so far as automobiles are concerned, will make its appearance on the American market next year.

For several years one of the leading French builders, De Dion-Bouton, has built eight-cylinder machines, and now this concern builds them in many different models. These machines are not untried creations, but rather designs that have been worked out for many years and have stood up, have proven themselves to be equal to the requirements.

The eight-cylinder motor looks like an enormity when contrasted with the six. The increase of two cylinders seems a big addition, but when the six is placed alongside the eight with its cylinders mounted V fashion in two sets of four, the eight really impresses the motor student. It is shorter than the six and has a crankshaft that rivals the four-cylinder one in simplicity. It is shorter than the six; in fact, due to the V mounting of the cylinders in the eight and to coupling two connecting rods to each throw, the motor is little longer than a four. The short crankshaft eliminates the whipping tendency met with in the long crankshafts in several of the six-cylinder designs.

The eight-cylinder motor with its cylinders cast in two L-head groups of four each makes a simple manufacturing job in that one camshaft mounted in the angle between the cylinder groups in the top of the crankcase serves for both intake and exhaust valves for the eight cylinders. The intake piping is considerably simplified as the carbureter is positioned midway between the two cylinder groups.

Judging from the performances of eight-cylinders now on the market the gasoline consumption is most satisfactory. In fact, eight-cylinder motors with an official rating between 20 and 25 horsepower have averaged from 20 to 22 miles to the gallon in regular country touring.

Whether the struggle for supremacy which has been waged for years between the four and the six will now be transferred to the eight, or if all three types of motors will continue in the arena, is a question that only time will solve. The aggression with which the eight is taken up will prove a potent factor. Today the public will not launch the arguments against the eight that were pressed against the four and the six, namely more cylinders, more valves, more spark plugs and more parts to go wrong. The complications offered by the two additional cylinders cannot be seriously considered. True, there will be some problems of value accessibility to deal with. The construction of the lower end of the connecting rod will call for attention, but if the eight can prove its claim to greater flexibility than the six, if its inherent merits of shorter crankshaft, more compact design, etc., carry that weight which they apparently should, then it will not be surprising if 3 or 4 years hence we find ourselves approaching a period of eight-cylinder popularity.

Motor Industry Supports 22 Per Cent. of Michigan's Population

90,673 Workers Employed in State's Automobile Factories and Stores, 71,104 Being the Number Detroit Keeps Busy

DETROIT, MICH., Aug. 13—The automobile industry ranks first as far as the total number of employes is concerned in the state of Michigan from statistics gathered from the annual report of the Department of Labor of Michigan for the year 1913. These records were obtained at different seasons of the year, some in May, some in August and some in November; for example, Chalmers, taken July 29, 1913; Packard, October 22, and Timken-Detroit, May 8.

Out of a total of 407,552 employes working in 11,823 factories, plants, shops, stores or other places of business employing wage-earners, 90,673, or 22.2 per cent. are employed in 582 concerns, manufacturers or retail stores, having some relation to the general automobile business. This total of 582 represents only 5.7 per cent. of all the business concerns visited by the labor officials.

From among the 90,673 men and women, boys and girls, earning their living in the automobile industry, 71,104 were employed in the city of Detroit, or 78.4 per cent.; and among them 37,662 or 41.6 per cent. were working in twenty-seven automobile manufacturing plants in Detroit.

Forty-two Car Makers in State

The number of automobile makers in the state, according to the annual report was only forty-two in 1913, or twenty-four less than in 1912. This does not mean that twenty-four concerns went out of business, but while some of them did, the majority were either absorbed by other companies or ceased making cars and continued in some other line.

While the general average of daily wages paid in 1911 was $2.23 for each of the 359,752 employes concerned in the record, it increased to $2.31 in 1912 and concerned 404,480 workers, and was $2.41 in 1913 for each of 407,552 employes, which means a net gain of 18 cents.

The average daily wages of the factory men increased 10 cents over the average of 1912 and 15 cents over that of 1911.

Factory women's increase was only 1 cent over 1912 and 9 cents over 1911. The average daily wages of girls shows an increase of 3 cents over 1912 and 1911, whereas, the wages of boys decreased 1 cent over 1912, but were still 17 cents higher than in 1911.

The superintendents' wages decreased 1 cent as compared with 1912, but were still 7 cents higher than in 1911. Foremen's wages increased 2 cents over 1912 and 21 cents over 1911.

	1913	1912	1911
Total number of establishments canvassed	11,823	10,589	9,456
Total number of all employes	407,552	404,480	359,752
Total number of men	302,802	304,738	269,492
Total number of women	49,604	48,475	44,598
Total number of boys between 14 and 16	2,026	2,457	1,995
Total number of girls between 14 and 16	1,285	1,502	1,456
Total number of superintendents	12,746	11,353	10,056
Total number of foremen	13,065	11,917	11,284
Total number of men at office work	15,199	14,407	12,692
Total number of women at office work	10,825	9,631	8,449
Aggregate daily wages paid all employes	$957,088	$913,376	$784,108
Average daily wages paid all employes	2.41	2.31	2.23
Average daily wages of factory men	2.47	2.37	2.32
Average daily wages of factory women	1.33	1.32	1.24
Average daily wages of boys	1.08	1.09	.91
Average daily wages of girls	.91	.88	.88
Average daily wages of superintendents	5.32	5.33	5.25
Average daily wages of foremen	3.77	3.73	3.56
Average number of hours male workers per day	9.6		
Av. number of hours female workers per day	8.7		
Average number of days worked per month	26.0	26.7	25.5
Average number of months worked per year	11.7	11.6	11.6
Total number of all employes connected with automobile industry in State	90,673	89,413	75,839
Total number of all employes in automobile plants in State	47,474	50,827	41,839
Number of automobile manufacturers in State	42	66	58
Total number of employes in automobile plants in Detroit	37,662	37,590	31,500
Number of automobile manufacturers in Detroit	27	34	30
Total number of employes in Detroit automobile and parts manufacturing plants	71,104	65,169	54,198

NUMBER OF EMPLOYEES IN DETROIT AUTOMOBILE PLANTS.

Name of Concern—Location.	When started in business	Total number of all employes 1913	1912	1911
Abbott Motor Co., Detroit	1910	178	465	446
Anderson Electric Car Co., Detroit	1895	696	589	408
Briggs-Detroiter Co., Detroit	1912	100	173	..
Cadillac Motor Car Co., Detroit	1905	2,892	4,878	5,426
Chalmers Motor Co., Detroit	1907	2,345	2,844	2,372
Century Electric Car Co., Detroit	1911	15	....	....
Commerce Motor Car Co., Detroit	1909	32	..	..
Federal Motor Truck Co., Detroit	1910	184	101	55
Ford Motor Co., Detroit	1903	14,100	7,317	3,593
Grinnell Electric Car Co., Detroit	1911	55	50	59
*Herreshoff Motor Co., Detroit	1909	78	79	43
Hudson Motor Car Co., Detroit	1908	813	1,391	760
Hupp Motor Car Co., Detroit	1908	1,017	806	599
Keeton Motor Co. / American Voiturette Co., Detroit.	1913	72	..	..
King Motor Car Co., Detroit	1911	114	110	42
Krit Motor Car Co., Detroit	1906	147	383	347
Lozier Motor Co., Detroit	1904	472	687	653
Maxwell Motor Co., Detroit	1906	585	2,753	..
Packard Motor Car Co., Detroit	1899	4,524	6,603	6,410
Paige-Detroit Motor Car Co., Detroit	1909	513	143	106
Regal Motor Car Co., Detroit	1907	822	333	399
R. C. H. Corporation, Detroit	1911	521	..	..
Studebaker Corp., Detroit	1908	6,970	3,471	6,581
Standard Motor Truck Co., Detroit	1911	40	7	27
Universal Motor Truck Co., Detroit	1909	326	155	..
Wagenhals Motor Co., Detroit	1911	21	6	..
Wahl Motor Co., Detroit	1912	29	7	..

*Now out of business.

EMPLOYEES IN AUTOMOBILE PLANTS OUTSIDE OF DETROIT.

Name of Concern—Location.	When started in business	Total number of employees 1913	1912	1911
Buick Motor Co., Flint	1906	4,700	5,411	4,584
Durant-Dort Carriage Co., Flint	1882	343	272	387
W. A. Patterson, Flint	1878	282	133	282
Alma Motor Truck Co., Alma	1913	27	..	..
Olds Motor Works, Lansing	1880	648	1,033	937
Reo Motor Car Co., Lansing	1904	1,700	1,675	519
Reo Motor Truck Co., Lansing	1910	165	160	22
Imperial Automobile Co., Jackson	1907	131	249	92
Jackson Automobile Co., Jackson	1902	252	629	557
Austin Automobile Co., Grand Rapids	1901	18	23	37
Couple-Gear Freight Wheel Co., Grand Rapids	1905	55	46	56
Cartercar Co., Pontiac	1907	287	433	253
General Motors Truck Co., Pontiac	1907	342	370	..
Oakland Motor Car Co., Pontiac	1908	734	922	849
Havers Motor Car Co., Port Huron	1910	56	87	32

TOTAL NUMBER OF EMPLOYEES IN MICHIGAN AUTOMOBILE PARTS AND ACCESSORIES MANUFACTURING PLANTS.

Name of Concern—Location.	When started in business	Total number of employees 1913	1912	1911
Michigan Motor Casting Co., Flint	1906	248	327	182
Auto Body Co., Lansing	1901	241	187	162
W. K. Prudden Co., Lansing	1903	706	420	410
Hayes-Ionia Co., Ionia	1910	319	320	218
Hayes Wheel Co., Jackson	1908	410	467	375
Keeler Brass Co., Grand Rapids	1900	263	213	181
Jackson-Church-Wilcox Co., Saginaw	1907	251	295	212
Weston-Mott Co., Flint	1905	1,180	2,151	1,205
Continental Motor Mfg. Co., Muskegon	1904	437	1,162	842
O. J. Beaudett Co., Pontiac	1890	814	518	386
Jackson Cushion Spring Co., Jackson	1900	237	195	138
Frost Gear & Machine Co., Jackson	1907	200	155	120
Briscoe Mfg. Co., Detroit	1897	440	768	767
Chicago Pneumatic Tool Co., Detroit	1902	509	373	361
Continental Motor Mfg. Co., Detroit	1904	971	741	598
Detroit Auto Specialty Co., Detroit	1903	234	136	70
Detroit Forging Co., Detroit	1900	267	211	171
Detroit Gear & Machine Co., Detroit	1910	212	120	130
Detroit Motor Casting Co., Detroit	1905	97	130	78
Detroit Pressed Steel Co., Detroit	1910	258	113	70
Detroit Steel Products Co., Detroit	1906	475	458	279
Fisher Body Co., Detroit	1908	1,529	1,272	1,302
Fisher Closed Body Co., Detroit	1910	562	263	..
Gemmer Mfg. Co., Detroit	1907	257	387	318
Dodge Bros., Detroit	1903	2,574	1,872	1,313
Hayes Mfg. Co., Detroit	1903	226	761	572
Herbert Mfg. Co., Detroit	1899	438	732	349
Long Mfg. Co., Detroit	1909	112	176	148
McCord Mfg. Co., Detroit	1897	557	899	576
Metal Products Co., Detroit	1909	497	559	381
Michigan Malleable Iron Co., Detroit	1899	956	880	473
U. S. Tire Co., Detroit	1883	3,095	2,266	1,615
Northway Motor & Mfg. Co., Detroit	1905	578	1,431	1,001
Rands Mfg. Co., Detroit	1901	263	174	195
Timken-Detroit Axle Co., Detroit	1909	1,582	1,119	1,007
C. R. Wilson Body Co., Detroit	1899	1,145	836	730

Record Exports in Last Fiscal Year

30,136 Cars Worth $27,797,642 and $4,159,454 Worth of Tires Show 13-Fold Growth in 10 Years

WASHINGTON, D. C., Aug. 15—The secretary of commerce today announced that exports of motor cars from the United States in the fiscal year ended June 30, 1914, were the largest on record. Their total, including shipments to Alaska, Hawaii, and Porto Rico amounted to $40,136,565, as against $39,325,000 in 1913, the former high record year. The year's total included 30,136 complete cars, valued at $27,797,642; tires, $4,159,454; motor car engines, $1,391,893 and miscellaneous parts, not specified, $6,787,575.

With the sole exception of 1908, every year during the past decade has shown an advance in the value of American motor cars sold to foreign countries. In the fiscal year 1904, according to the bureau of statistics, the value of motor cars exported was $1,895,605; in 1909, $5,387,021, and in 1914, exclusive of parts and shipments to our own non-contiguous territories, $26,574,574, having quintupled in 5 years and increased thirteen-fold in a decade.

Europe Bought Nearly Half

Europe bought nearly one-half of our entire sales of motor cars to foreign countries last year, although some shipments are for reshipment to other parts of the world. To the United Kingdom the exports amounted to 7,222 cars, valued at $5,853,127; to Germany, 1,435, valued at $1,059,249; to France, 1,429, valued at $1,224,130; and to other countries of Europe, 3,271, valued at $2,580,428. Canada and Australia also are important markets, the former having taken 4,624 cars, valued at $5,919,776 and the latter, including other British Oceania, 4,244, valued at $3,695,595. To South America as a whole we sold last year 1,985 motor cars, valued at $1,939,212, and to Mexico, 167, valued at $256,675.

The growth in exports of motor cars has been accomplished by a corresponding decline in imports of like articles, the total having fallen from 1,624, valued at $2,905,391, in 1909, to 300 cars, valued at $620,493, in 1914, a new low record for the decade. Of the year's imports, 134 were from France, 40 from the United Kingdom, 55 from Italy and 21 from Germany.

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German Motor Exports Shrunk Before War

DETROIT, MICH., Aug. 17—From the official records of the German government it is shown that the German exports of automobiles, motor cycles, parts and accessories during the first 5 months of 1914, ending with May, show a total decrease of $3,016,000 as compared with the corresponding periods of 1913. In other words, while the German manufacturers sold outside of the Fatherland $11,443,750 worth of motor cars, motor cycles, parts and accessories from January 1 to May 30, 1913, this year, during those 5 months, they sold all told only $8,427,750 worth of the same goods.

The detailed reports as to the exports to each foreign country are not at hand, only the totals. Thus it is seen that up to the end of May, 1914, a total of 3,227 pleasure vehicles having a total value of $6,158,250, or an average value of $1,908 each, were exported. In 1913 the exported cars numbered 3,630 having a value of $8,381,500 or $2,309 each. Thus for this year 403 less pleasure cars were exported, which meant a difference of $2,223.250 to the manufacturers while the 1914 car's average value was $401 less than that of 1913.

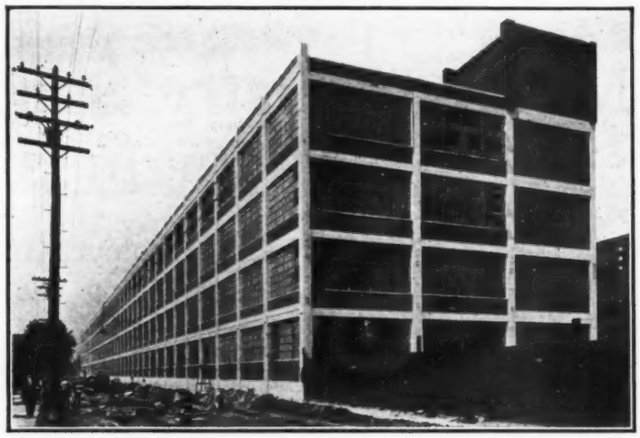
The number of commercial cars—trucks and delivery vehicles—exported during the first 5 months of 1904 was 294 as compared with 468 in 1913. Their value was $904,500, as compared with $1,564.250 in 1913. The price was $3,076 per truck this year and $3,342 last year. The sales were 174 trucks less in 1914 than 1913 and in dollars it represented a loss of $659,750.

Up to the end of May, 1914, the German manufacturers had exported 1,428 motorcycles valued at $304,000, or an average of $212 each, while in 1913 they had sold 1,972 motorcycles, of a value of $393,500, or $299 each. The decrease this year was thus 544 motorcycles and $89,500.

The export of automobile parts during the first five months of 1914 amounted to $861,500, or $144,500 less than in 1913.

Automobile and motorcycle motors to the value of $199,500 were exported this year up to the end of May, and this represented an increase of $101,000 over the first five months of 1913.

The total value of pleasure vehicles and commercial cars exported during the first 5 months of 1914 was $7,062,750, while in 1913 this item totalled $9,945,750, or nearly $2,900,000 more for the first five months of 1913.



New assembling plant added to Dodge factory

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Big Dodge Addition About Finished

DETROIT, MICH., Aug. 17—Dodge Bros. announce the practical completion of the assembling plant which has been added to the factory. This building is 876 feet in length and 70 feet in width and four stories in height and is constructed to withstand a floor strain of 350 pounds to the square foot. With the addition of this building the floor space of the factory which is to be devoted to the manufacture of the Dodge Brothers' car is 18 3-4 acres.

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More Cowles Patents for Packard

DETROIT, MICH., Aug. 17—In accordance with its policy of continually strengthening its patent position, the Packard Motor Car Co. has followed up its purchase of several years ago of the Cowles motor vehicle patent applications and is now having issued to it a number of divisional patents based upon the original patent No. 1,050,810, the application for which was filed on September 6, 1901.

The latest of these to issue is that relating to the truss rod construction, taking into consideration torsion tube design and trunnion springs. This is dated August 11, 1914, and its patent number is 1,107,042. There are two others of these divisional patents which have been issued, and more to be granted in the near future. Still others are likely to be held up at the patent office for a few months longer in accordance with usual patent office procedure. The other two issued are: the main patent, No. 1,050,810, dated January 21, 1913, and relating principally to an improved steering wheel hub and means for mounting the same, and 1,103,567, dated July 14, 1914, and relating to the running gear and steering mechanism.

It must be understood that all of these divisional patents are based upon the one main patent applied for on September 6, 1901, and granted under patent No. 1,050,810. The patent office permits of such divisions under main patents, and the Packard company is taking advantage of this ruling for its strengthening.

Edward P. Cowles is the originator of the ideas involved in the Cowles patents, and holds the unique distinction of being the designer of the first automobile invented by J. W. Packard, while he was in the latter's employ at Warren, O., in 1896. Two years later, in 1898, Mr. Cowles began work on the plans for a motor vehicle of his own invention, and shortly afterward the specifications were completed and proceedings instituted for patents. All these rights have since been assigned to the Packard Company.

The Patent Department of the Packard Company, of which Mil-

ton Tibbetts, Packard patent counsel is the head, attaches considerable significance to these Cowles patents for obvious reasons. The divisional patents growing out of the broad claims of the main original patent relate to such features as an improvement in rear axle construction, interchangeable wheels, spring construction, frame construction, body design, steering connections, rear signal device, mounting of the motor, shock absorbers, and so on.

Patent No. 1,107,042 has seventeen claims which deal broadly with the construction of the car. The particular points which are brought out in the patent are the flexible connection of the sprung portion of the car to the unsprung portion and the method of transmitting the torque strains flexibly through the torque members.

Patent No. 1,050,810 has eight claims relating to the connection between the axle and the front wheels. It covers particularly the trunnion method of connecting the wheel hub to the axle. The construction particularly mentioned is a combination of a forked trunnion support in which the trunnion has its arms extended so that the jaws are above and below the inner hub member, and arms which connect the wheel bearings to the vertical trunnion.

Patent No. 1,103,567 relates to the connection of the steering gear to the front wheel spindle. The particular point covered is that the tread of the wheel at the point of contact with the ground is vertically in line with the large bearing mounted at the base of the spindle. In other words, this specifically deals wtih the pivot point of the wheel being vertically in line with its axle support, thus providing the easy steering feature generally sought in front axle design.

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More Cars Sold for Australian Market

DETROIT, MICH., Aug. 10—F. Z. Eager, an American automobile importer established in Australia, was here recently and placed orders for about 1,000 cars, or 50 per cent. more than last year.

"An American car costing $1,000 here is listed at $2,000 when it finally gets on the show room in Australia," said Mr. Eager. "Duty and other customs charges bring the car up to $1,250, and after the freight to the Australian port is added, with the incidental expenses, the car will stand at $1,500. Then other charges are to be added, and the dealer's percentage or commission, so that the car must be sold at $2,000.

"Even so, the sale of American medium-priced cars is steadily increasing, as they have proven through tests, trials, hill-climbs, etc., that they are best suited for the Australian roads. These are in many parts of Australia about what they are in South America and Africa, that is, they are called roads, but actually nothing like a road exists. The variety of roads is such that it is the best testing ground nature affords. And the very reason why the American cars are now so well liked is because the people now know that the American roads are very bad, and also require cars that will stand the biggest stress than can be found.

"The rich Australians purchase the high-priced cars made in Europe, but not so much because they consider them so much more worthy, but because it is the style. The wealthy man or woman who has not his or her big European car is quite an exception."

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Splitdorf-Apple Plants All in Newark

NEWARK, N. J., Aug. 17—With the purchase of 5 acres of land, buildings giving 70,000 square feet of floor space and an office building all ready for occupancy, the Apple Electric Co. is preparing to move its headquarters for the manufacture of automobile and motor boat starting and lighting outfits and batteries from Dayton, O., to Newark, N. J.

The move will not be immediate, however. The Apple company products will continue to be manufactured at Dayton until the new plant has demonstrated its efficiency to turn out the work in volume and up to the Apple standard of quality in every respect. This plan was decided upon to eliminate all chance of the slightest hitch in making deliveries.

The important move follows the drawing together of the manufacturing and selling policies of the Splitdorf Electrical Company with those of the Apple interests, and the controlling of the Apple output by the dominant Splitdorf sales organization. The Splitdorf executive offices and manufacturing plant have been located in Newark for two years, and, with mutual interests at stake, a greater degree of co-operation from closer association is anticipated.

The new Apple factory will be the buildings formerly occupied by the Lansden Electric Co., and the surrounding ground purchased by the Apple company gives ample room for almost unlimited extension should occasion arise.

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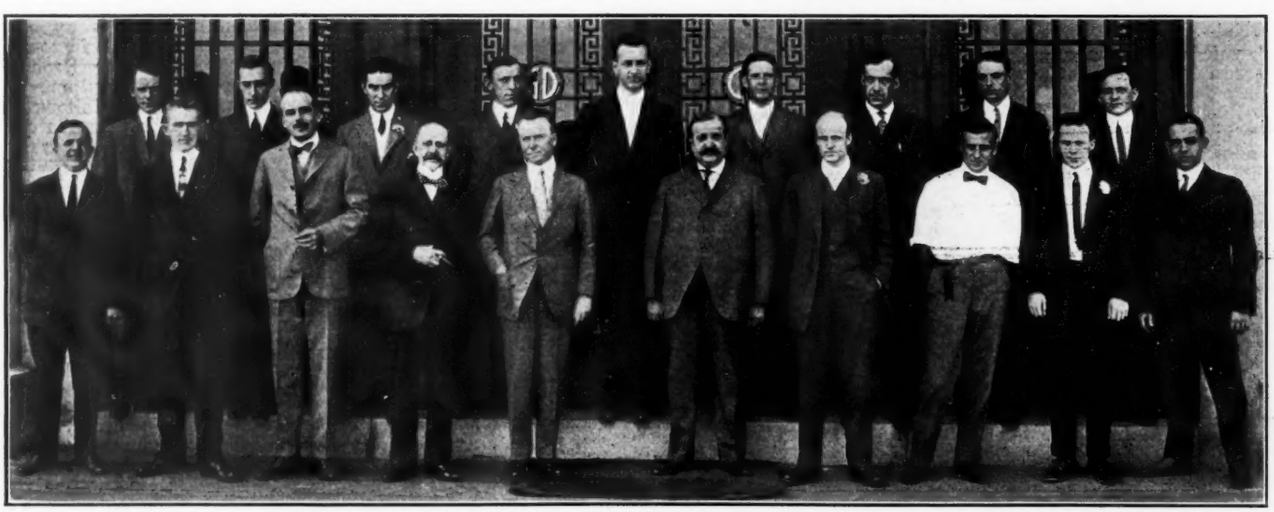
MILWAUKEE, WIS., Aug. 18—The Federal Rubber Mfg. Co., Milwaukee, will celebrate "Federal Day" on next Saturday, August 22, by entertaining its 2,500 employees and their families at an all-day picnic at Waukesha beach, Pewaukee lake.

New Apple Electric Co.'s factory in Newark



Group of the Gray & Davis salesmen and officers at the convention held at the factory August 3-8. Top Row—Left to right—G. C. Marr, purchasing agent; E. G. Acker, production manager; J. H. Maxwell, secretary; O. W. Cook, assistant factory supt.; C. M. Tichenor, chief mech. engineer; E. R. Hodges, R. W. Carr, K. Greenleaf, C. Z. Sedgley, sales engineers. Bottom Row—Left to right—A. G. Haskell and G. L. Gaskell, sales engineers; C. O. Sacks, advertising manager; E. E. Schwarzkopf, sales manager; Wm. Gray, president; W. H. Gray, general manager; E. F. Wackwitz, sales engineer; W. B. Moses, electrical engineer; R. Hoyt Moses and A. Driver, sales engineers. Three of the salesmen who attended the convention and also Mr. Picard, manager of the Ford sales department, were not at the factory when the photograph was taken. The next convention will be held early in January

Goodyear Returns to Old List Tire Prices

Is Only Company To Do So — Top Market Prices of Crude Rubber Prevail —Some Increases

NEW YORK CITY, Aug. 19—The Goodyear Tire & Rubber Co., Akron, O., has returned to the list prices in force before the war scare and has instructed all its branches accordingly. None of the other companies has announced a reduction in prices.

Last week the principal tire companies, with a few exceptions, had advanced prices from 12 1-2 to 20 per cent. Some of the smaller companies had not announced changes.

This week practically all have reached the higher level, but none have advanced beyond the first increases.

The crude rubber situation, according to F. R. Henderson, of the rubber importing firm of Henderson & Korn, is practically unchanged. The high price of $1.10 for plantation and $1.12 for Para still holds without an advance, and there is no more rubber in America now than there was a week ago. Neither is it likely that there will be any more for some time.

Press cables from Europe during the past week have indicated that shipping might be resumed within a short time. Without being pessimistic Henderson stated that the "short time" might be months. Private cables from London to the Company state that the "resumption of shipping at first opportunity may mean many months." This is regarded as significant, inasmuch as it is the scarcity of ships and not of rubber which has caused the shortage in America.

Ajax-Grieb, Kelly-Springfield and Michelin, which did not raise last week, are still holding to their old prices. As officers of the two former stated, they will not raise until the manufacturing cost actually increases.

Empire, Federal, Firestone, Fisk, Goodrich, Diamond, Goodyear, Pennsylvania, Republic and United States advanced last week 12 1-2 and 20 per cent. Later advances are: Lee, 12 1-2 per cent.; McGraw, 15; Racine, 15; and of the importers, Englebert, 10 per cent. Gaulois is awaiting advices from the factory in France before it alters prices.

A comparison of the new and old prices in a 34 by 4 size of those which have followed the raise is: Lee Regulars—Plain, $19.10, $25.85; non-skid, $33.10, $37.25. Lee Puncture-Proofs—Plain, $38.25, $43.05; non-skid, $47, $52.90. Lee red tubes, $5.75, $6.45.

McGraw—Plain, $24.35, $28; non-skid, $26.05, $29.95; red tubes, $5.45, $6.25; gray tubes, $4.90, $5.65.

Racine—Plain, $26.80, $30.80; non-skid, $33.50, $38.50; red tubes, $6, $7.20; gray tubes, $5.40, $6.50.

The 12 1-2 per cent. advance in Pennsylvania does not include tubes or Vacuum Cup tires which, the company having a good stock, were increased but 5 per cent. The red 34 by 4 tube went from $7 to $7.35 and the gray from $5.30 to $5.95. The vacuum cup in the same size was increased from $41.95 to $44.05. Smooth treads were increased from $28.30 to $31.85.

The Englebert increase was thus: Plain, $32.20, $35.50; rubber non-skid, $36.80, $40.50; steel-studded, $41, $45. Tubes unchanged.

Market Reports for the Week

A further reduction in prices occurred this week in the markets. Tin, this week, was very erratic with violent fluctuations. Starting the week at $64 per 100 pounds, it rose to $65 and gradually dropped to $40 and then closed at $49. At the latter part of the week there were quick sales of small lots. More tin is expected from London but the situation from the Straits Settlements is not so clear. The cargoes afloat for this country at the moment are 920 tons, of which 240 tons are due before the end of the month. There is a small demand from domestic customers in copper. The sales are confined to August and September shipment. Up-River Para has dropped $0.30, closing at $0.90. A syndicate is reported to have bought up the bulk of the supply in London with the intention of shipping it to this country. Also there is a prospect of an increase in the supply of Brazilian rubber.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Changes
Antimony	.15	.15	.13	.13	.12	.12	—.03
Beams & Channels, 100 lbs.	1.31	1.31	1.31	1.31	1.31	1.31	.....
Bessemer Steel, ton	20.00	20.00	20.00	20.00	19.00	19.00	—1.00
Copper, Elec., lb.	.12⅜	.12	.12	.12	.12⅛	.12⅛	— .00⅛
Copper, Lake, lb.	.12½	.12½	.12½	.12½	.12⅜	.12⅜	— .00⅛
Cyanide Potash, lb.	.17	.17	.17	.17	.17	.17	.....
Fish Oil, Menhadden, Brown	.40	.40	.40	.40	.40	.40	.....
Gasoline, Auto, bbl	.13	.13	.13	.13	.13	.13	.....
Lard Oil, prime	.93	.93	.93	.93	.93	.93	.....
Lead, 100 lbs.	3.85	3.85	3.85	3.85	3.85	3.85	.....
Linseed Oil	.60	.60	.60	.60	.60	.60	.....
Open-Hearth Steel, ton	20.00	20.00	20.00	20.00	19.00	19.00	—1.00
Petroleum, bbl., Kans., crude	.75	.75	.75	75	.75	.75	.....
Petroleum, bbl., Pa., crude	1.55	1.55	1.55	1.55	1.50	1.50	— .05
Rapeseed Oil, refined	.59	.59	.82	.82	.82	.82	+ .23
Rubber, Fine Up-River, Para	1.20	1.15	1.15	1.10	1.08	.90	— .30
Sulphuric Acid, 60 Baume	.90	.90	.90	.90	.90	.90	.....
Tin, 100 lb.	64.00	65.00	55.00	47.00	40.00	49.00	—15.00
Tire Scrap	.04¼	.04¼	.04¼	.04¼	.04¼	.04¼	.....

Swartz Carburetor Co. Organized

COLUMBUS, O., Aug. 17—The Swartz Carburetor Co., which was incorporated recently with an authorized capital of $50,000, has been organized by the election of the following officers: M. A. Corbett, president; Thomas A. Swartz, vice-president; R. J. Corbett, secretary; and F. E. Stevens, treasurer. The company will make a carbureter invented by Thomas A. Swartz which is claimed to give greater mileage and also to be more flexible than existing carbureters. The factory will be located in Columbus.

Saxon Co. Takes Over N. Y. City Branch

NEW YORK CITY, Aug. 18—The Saxon Motor Co., Detroit, Mich., has taken over the business of its New York City agent, L. A. Van Patten, Inc., 251 West Fifty-seventh street, making it a factory branch. The company expects to use the branch in developing the foreign trade as well as that in the New York territory. It has leased an upper floor of the building at Fifty-fourth street and Broadway, where the A. Elliott Ranney was located, for a service department. It is to be known as the Saxon Motor Co., of New York.

The company is contemplating changes in the perfection of the new dealer organization in Boston, California, Dallas and Denver. It has just arranged with the Liniger Implement Co. to replace the Stefart Too-Zer Co., Omaha, Neb., in the selling of Saxon cars. The Bond Motor Co. replaces the Saxon agency in Kansas City, Mo. The Essex Motor Car Co. now has the Newark, N. J. agency.

Philadelphia Oakland Branch Entertains

PHILADELPHIA, PA., Aug. 14—More than fifty dealers from Eastern Pennsylvania, Southern New Jersey, Maryland, Delaware and Virginia assembled here yesterday as the guests of Ted Johnston, manager of the local factory branch of the Oakland Motor Co., 227-229 North Broad street. A thorough inspection of the branch, its equipment and facilities, and of the new model Oaklands was followed by a dinner at the headquarters of the Philadelphia Automobile Trade Association.

Next Tuesday the Maxwell Motor Co., Inc., will give a reception and luncheon to the Maxwell dealers in the Philadelphia territory. During the luncheon, "From Molten Steel to the Automobile" will be shown in motion pictures.

Frisco Trade Unites Against Price Cutting

SAN FRANCISCO, CAL., Aug. 10—After hearing R. H. Daniels, head of the service bureau of the Goodyear Tire & Rubber Co., Akron, O., in a talk on upholding the prices on tires and other rubber goods and accessories made by the tire concerns and directly interesting the automobile supply and accessories dealers, about 120 decided unanimously to form the Motor Car and Accessories Trade Assn., the officers of which will be elected within a short time.

President J. A. Marsh, of the Motor Car Dealers Assn., presided, and spoke in favor of the co-operation, not only of the supply and accessories dealers, but also of the motor car agents, as the whole trade was interested in the matter, and should help in eliminating the price cutting policy. "Trade will be better for all concerned," said Mr. Marsh, "and it will help the legitimate concerns."

Dealers in Stockton, Oakland, and other cities in this territory have already started organizations for the same purpose, and district attorney H. L. Hynes, Alameda county, was quoted as holding that such organizations do not violate

the Cartwright anti-trust law. The United States District Attorney was also reported to have given his opinion that such trade organizations do not conflict with the federal law and that they were state issues.

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Hays Buys Michigan Buggy for $45,000

KALAMAZOO, MICH., Aug. 17—Judge Sessions, of the Federal Court, Grand Rapids, Mich., has decided that the bid of $45,000 made by former Mayor Charles B. Hays, of this city, for the plant of the bankrupt Michigan Buggy Co., should be confirmed, and thus the sale of that property, which has given way to many bids which had been refused because they had not reached the sum estimated as minimum by the Court becomes history.

Mr. Hays bought the plant purely as an investment, and does not intend to enter the manufacturing field.

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DETROIT, MICH., Aug. 11—Shipments of the 1915 Hupmobile models were started today. During the next ten days only thirty-five cars will be the daily output, but after that time the output will be doubled.

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Receiver for Savage Co.; Officers in Jail

DETROIT, MICH., Aug. 14—James J. Larmour has been appointed receiver for the creditors of the Savage Motor Car Co., whose officers are held in the county jail, Detroit, having been placed under arrest August 10 by government inspectors for using the United States mails to defraud. After a preliminary hearing, E. E. Taylor, Robert W. Fishback and Delbert H. Cummings, the three officials of the company were about to be set at liberty under $7,500 bail bonds being furnished by each, when new complainants appeared, and after hearing them Acting United States Commissioner Elmer W. Voorheis required a further bail bond of $5,000, so that each of the accused was to provide $12,500 in order to gain temporarily his liberty. Attorney C. E. Wilcox, who appeared for creditors, had prepared an involuntary bankruptcy petition and prevented the accused from drawing money from the Federal State Bank, where the company's funds were deposited.

No further action will be taken by assistant district attorney Benedict Lee until the bankruptcy proceedings in the United States court will have been disposed of. It is not yet known where the accused will be tried, as warrants have been issued against them both in Cincinnati, O., and in Detroit, and it will probably be in the city where a true bill is first returned.

Details concerning the financial standing of the Savage company are not available now. Reports have been published in daily papers, but Receiver Larmour stated that they were all imaginary.

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Dodge Bros. Sue to Protect Name

DETROIT, MICH., Aug. 17—Dodge Bros. have filed a suit in the Circuit Court of Michigan against the Dodge Motor Car Co. to restrain the latter from using the name Dodge on its product, in its advertisements, in fact in any matter concerning their business.

It is claimed by Dodge Bros. that the officers and stockholders of the Dodge Motor Car Co.—Alvin M. Dodge, J. Moyer Leman, E. O. Millay, Edwin Herzog and George E. Sheldrich—are trying to profit by the name of Dodge Bros., which has existed for the last twelve years in Detroit, and whose business is so well established and known throughout the country.

Mr. J. Moyer Leman, of the Dodge Motor Car Co., when asked to-day concerning the Dodge Bros. suit, said: "All we know about this suit is what we have read in the daily papers. No papers have been served on us as yet, and if they are we certainly will fight the case to the limit."

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Delay for Oldfield Patents Bill

WASHINGTON, D. C., Aug. 15—Of great importance to the motor car and accessory trade of the country is the action of the House committee on patents in reporting favorably the Oldfield bill to codify, revise and amend the laws relating to patents. While the committee has acted favorably on the bill, it is understood no action will be taken at this session. Probably during the short session, which begins in December, the bill will be pushed through by its author. In order that those vitally interested in the changes proposed will know just exactly what the bill provides, the text of the bill, as reported to the House of Representatives, is herewith presented in part:

Section 4884 is to be amended so that every patent shall contain a short description of the invention to indicate its nature. And a copy of the specifications, claims and drawings shall be attached to the application. It shall contain a grant to the patentee, his heirs or assigns of the exclusive right to make, use or vend the invention throughout the United States for a term of 17 years.

Two years will be allowed for the work of obtaining the patent after the application is first filed. It is stated that every patent shall be limited to expire 19 years from the date of filing in this country, but this is exclusive of the time actually consumed by the Patent Office or the courts in considering the application.

Sec. 2—Section 4899 of the Revised Statutes shall be amended so that no person selling a patented article shall have a greater right to prescribe the conditions limiting its subsequent disposition than if the device were not patented.

Every person who purchases, of the inventor or constructs any newly invented machine prior to the application of the inventor for a patent or who sells or uses one so constructed, shall have the right to use and to vend to others to be used, the specific thing so made or purchased without liability.

No purchaser, lessee, or licensee of a patented article shall be liable to an action for infringement of the patent because of any breach of the contract of sale, lease or manufacture.

In Section 3 it is set forth that the district court wherein the owner of the patent may be found shall have the right to compel the granting of a license according to the circumstances stated in the bill.

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Steel Orders Are in Bigger Volume

NEW YORK CITY, Aug. 14—The United States Steel Corp. has made its monthly report of unfilled orders, making the best showing in 3 months. Unfilled orders on the books at the end of July were 4,158,000 tons, in round numbers, an increase of 125,700 over the total at the end of June.

Automobile concerns are having difficulty getting supplies of a special nature. Sixty cars of glass bought in Belgium by Detroit automobile makers for windshields are held up.

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Detroit Curb Pumping Stations Must Go

DETROIT, MICH., Aug. 16—The Commissioner of Public Works of the city of Detroit, has advised every gasoline stand and station within the city limits that they will have to remove by October 16 their curb or sidewalk pumping outfit.

It is the contention of the commissioner that inasmuch as the Supreme Court of Michigan recently rendered a decision in favor of the city that fruit stands must be removed, and that the city has the right to remove any obstruction on its sidewalks and curbs, that gasoline curb supplying stations are obstructions and must consequently be removed.

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Gasoline Storage Near Residence a Nuisance

DETROIT, MICH., Aug. 17—A decision was rendered some time ago in the Circuit Court of Kent County, Mich., which may have a far-reaching effect inasmuch as the court held that the storage of a large quantity of gasoline within a few feet of a residence is a private nuisance.

The case was the one of Arthur W. Whittemore, who owns and occupies a house and lot adjacent to the Baxter Laundry Co., in Grand Rapids, Mich. The Baxter Company, which does a dry cleaning business, uses about 15,000 gallons of gasoline per year and prior to the filing of the bill in the case, had placed in its yards two large steel tanks of the capacity of 10,000 gallons each and had commenced excavating for the purpose of having these tanks placed in the ground in the northwest corner of its premises, which was the farthest possible point on its premises from its buildings and immediately adjoining Whittemore's property, the nearest tank being about eleven feet from his property. Whittemore filed a complaint for a temporary injunction, claiming that the storage of the gasoline so near to his property would be a private nuisance.

In the lower court it was held that it was a private nuisance. The Baxter company appealed to the higher court, which upheld the lower court's verdict.

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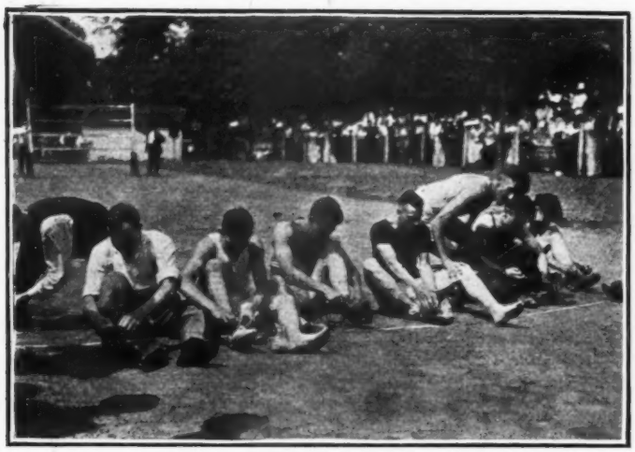
NEW YORK CITY, Aug. 18—G. L. Holmes has retired as general manager of the automobile accessory department of the H. W. Johns-Manville Co., this city. E. A. Cassidy will take his place, his former position being sales manager of the department. H. H. Knepper, who has been assisting Stephen Douglas, manager of the Detroit office, has also resigned.



Two pictures of the obstacle race at the annual outing of Packard employees held at Bob-Lo, Mich., August 10, at which a total of about 6,000 of the company's working force took part. Three of the largest Detroit River steamers were used to transport the happy crowd. The features of the day were the various athletic contests, such as inter-department relay races, dashes and obstacle races, fat man races, races for small boys and for women. One of the events which was most successful, and a novelty, was a pie-eating race for small boys. There were also swimming races and other events held in the water. On account of the heavy rain the baseball and soccer games could not be held in the open and were replaced by the followers of Terpsichore in the dancing pavilion

N. Y. Fire Marshal Develops "Gasoline Peril"

NEW YORK CITY, Aug. 17—State Fire Marshal Thomas J. Ahearn, of New York, has unearthed a "gasoline peril"; and in unearthing it he has developed a "garage regulation peril" which is faced with awe and real dread by the garagemen of the state.

After figuring out that gasoline properly mixed with air and compressed "is equal to 83 2-3 pounds of dynamite" he has promulgated a set of garage regulations which, if enforced, will cost the garages of the Empire State thousands of dollars and perhaps put some of them out of business.

The move has attracted the attention of trade organizations, and the Automobile Dealers' Association of New York, has already begun an investigation of this latest official hobby of regulation.

Some of the regulations are particularly drastic. One forbids the maintaining of a repair-shop in a garage. No more pits are to be allowed. Gasoline tanks may not be maintained under sidewalks, but must be buried 3 feet underground elsewhere and proper piping carried to the garage or curb.

Torches, forges, fire, flame or any electrical apparatus capable of emitting a spark are banned. Heating shall be by steam or hot water. No building or part thereof shall be converted into a garage or used as a garage unless it is fireproof.

These are a few of the rules and regulations. There is, of course, provision for the ubiquitous permit and inspection by 1,700 deputies. The regulations go into effect December 1, 1914, and a "reasonable time" will be allowed for the altering of existing structures.

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New Westcott for $1,150

RICHMOND, IND., Aug. 17—The price of the series B Westcott has been reduced to $1,150 for 1915. The car is equipped with a Northway motor, the Atwater Kent ignition system and the Jones electric starting and lighting system. The Westcott Motor Car Co. states that an increase in business is expected during the coming season.

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Tribute for Charity in Kansas City Fuel War

KANSAS CITY, MO., Aug. 17—Five charities of this city are to benefit by the latest move in the gasoline price-cutting campaign now raging between the Standard Oil Company and the independent refineries. The Rockefeller corporation has announced that it will give one-half cent to charity for each gallon of gasoline sold at its filling station here in August. The money will amount to between $2,000 and $3,000, it is understood, and will be divided among the Associated Charities, The Jewish Educational Institute, Mercy Hospital, the Orphan Boys' Home, and Swope Settlement.

The last reduction here brought gasoline from 10.8 cents to 10.3 cents a gallon. The charity-sharing plan will not be extended to other cities, it was declared here. So far, the independent refiners have made no similar move.

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Permanent Motor Pavilion at Indiana Fair?

INDIANAPOLIS, IND., Aug. 17—There is a movement on foot for a permanent building at the Indiana State Fairgrounds to house motor car exhibitions, which would be held annually during the fair. It is regarded as likely that the Indiana legislature, next January, will be asked to allow a substantial appropriation for the purpose.

During the fair beginning September 7, the Indianapolis Automobile Trade Association will give a display of motor cars, parts and accessories. This will be held in a large tent and all of the space was taken several weeks ago.

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Safety-First M. C. Co., a New Michigan Concern

SOUTH BEND, IND., Aug. 17—The Safety-First Motor Car Co., Kalamazoo, Mich., capitalized at $10,000, has filed articles of association with the secretary of state and is making plans for the manufacture of motor cars and trucks on a patent secured by Frank Dentler, of Vicksburg, Mich. The offices of the new concern are located at 210 Kalamazoo National Bank building, Kalamazoo. The officers of the company are: F. A. Young, president; W. P. Haines, vice-president; and George J. Haines, secretary and treasurer. It is the plan of the company to manufacture auto trucks, and automobiles and gasoline engines.

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L-P-C Designer Attending Army Trucks

RACINE, WIS., Aug. 17—Wm. Mitchell Lewis of the L-P-C Motor Co., maker of the Lewis six has issued the following statement:

"M. Petard, our designer and chief engineer, being a native Son of France and a Captain in the Reserve Engineering Corps, has been ordered to report for dutv; the Lewis Six, which M. Petard was testing out in the Alps, has been commandeered as the personal car of the Colonel of his regiment and the French yellow body has been painted a battleship grey.

"Petard was responsible for a large part of the engineering work on the motor trucks and tractors used by the French Army and it can readily be seen that his services to his country will be of tremendous importance. We had expected M. Petard to return to this country in September, but the duration of the war, if France is actively engaged, will represent the period of his absence. While we would like to have him with us, his work as designer and chief engineer has anticipated our requirements up to January 1, 1917, and all refinements to be incorporated in the Lewis Six for that period have already been thoroughly tested out."

"All Out for Elgin Races" with 32 Entries

Twenty-seven Cars Named for C. A. C. Trophy Next Friday—All for Free-for-All Saturday

CHICAGO, Aug. 17—Showing that the interest in racing is keener than ever and that the European war is not having any effect on the sport in this country, the Chicago Automobile Club to-day announced a record-breaking entry list for the fifth annual Elgin road races, which will be run off next Friday and Saturday.

Thirty-two cars for a total of fifty-nine entries are declared for the 2 days. On the first day, when the Chicago Automobile Club trophy will be contested for by cars of 450 cubic inches and under, twenty-seven are nominated, while in the free-for-all for the Elgin National trophy on the second day the full complement of thirty-one cars is billed to start. All cars are nominated for both days except the Lozier, Chadwick, one of the Whites, one of the Duesenbergs, a Rae and Burman special.

It is a most representative field, too, made up for the most part of private entries. The Stutz, Mercer and Maxwell really are the only factories directly represented. Others are backed by private owners, and Chicago is particularly strong in this respect, with nominations from Charles E. Erbstein, E. C. Patterson and Frederick Robinson. Frank Fox, of Indianapolis, is another of those who back racing cars for the love of the sport and not because of trade inclinations.

The thirty-two cars represent sixteen different entrants. Six foreign machines—three Peugeots, two Sunbeams and a Mercedes—are in the lot, while the White is a newcomer so far as Elgin is concerned. The complete entry list is as follows:

CAR	ENTRANT	DRIVER
Peugeot	E. J. Schroeder	Not named
Stutz	Stutz Motor Car Co.	B. Oldfield
Stutz	Stutz Motor Car Co.	G. Anderson
Sunbeam	W. Ziegler, Jr.	H. Grant
Sunbeam	W. Ziegler, Jr.	G. Morris
Peugeot	L. C. Erbes	R. Burman
Marmon	C. E. Erbstein	L. Heinemann
Stutz	W. Ziegler, Jr.	F. H. Dearborn
Mercedes	E. C. Patterson	R. de Palma
Duesenberg	F. Duesenberg	E. Rickenbacher
Braender Bulldog	W. Chandler	W. Chandler
Duesenberg	Fred Duesenberg	Tom Alley
Pahys	F. Robinson	M. Roberts
Mercer	Mercer Automobile Co.	S. Wishart
Mercer	Mercer Automobile Co.	E. Pullen
Mercer	Ed Schillo	C. Luttrell
Gray Fox	Frank Fox	H. Wilcox
Peugeot	Peugeot Import Co.	R. Mulford
Lozier	R. H. Knowles	L. Fontaine
Marmon	C. E. Erbstein	M. Stringer
Marmon	Moross Amusement Co.	W. D'Alene
Maxwell	Moross Amusement Co.	T. Tetzlaff
Maxwell	Moross Amusement Co.	W. Carlson
Maxwell	Moross Amusement Co.	Not named
Rae	Elmer Rae	Fritz Walker
Chadwick	Auto Service Corp.	J. C. Hoskins
Duesenberg	F. E. Duesenberg	E. O'Donnell
Great Western	James Forsey	W. Tidmarsh
White	R. A. Bennett	W. J. Shrunk
White	R. A. Bennett	Eli Caillouette
Keeton		Callaghan
Burman Special		

Of these, it is known that the E. J. Schroeder Peugeot will not start. Schroeder was the first to enter and he was counting on de Palma driving for him. Then de Palma signed with Patterson, after which Schroeder abandoned all idea of coming to Elgin. No work has been done on the car since Indianapolis.

The Rae really is an old Mercedes rebuilt. It is of the vintage of 1903 and has been modernized by "Mercedes Fritz" Walker, who will drive the car himself. The Pahys is new, built by Frederick Robinson, a theatrical man who formerly was a locomotive engineer and who has introduced in it some of his own ideas.

The Elgin meet this year will differ from its predecessors in that the Pendleton system of scoring will be used, whereby the position of each car at each mile post will be posted. This has been used at Santa Monica for several years with great success. Then the system of starting two cars at a time, as in the French Grand Prix, will be used, which should add greatly to the interest in the races. The course is the same as before, and in each race the distance will be the same—301.65 miles. The prize fund totals $6,000, with $2,000 for first, $700 for second and $300 for third, with $200 purses for the fastest lap each day given by Harry Vissering, president of the Chicago Automobile Club, and Martin J. Kavanaugh.

On August 18, Spencer Wishart set a lap record while practising for the national road races. He circled the 8 1-2-mile course in 6 minutes 24 3-5 seconds, a rate of 79.8 miles an hour. The previous record was held by Tetzlaff who made it in 6:26.

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Official practice started this morning with nearly every entrant at the course. The men will be given 2 hours each day. No practice will be allowed on Thursday. The races start at 11 o'clock each day.

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White Dealers and Owners on Big Tour

CLEVELAND, O., Aug. 18—A tour which has all the elements of the old, familiar sociability run is being held this week and next by S. W. Forrester, the White dealer in Manhattan, Kan. The town has only 6000 inhabitants, but Forrester has found a good list of entrants in his tour.

The hundred or more motorists in about 25 cars started from Manhattan August 17 and were to reach Denver, Col., August 19. After four days of touring in the latter state the "motorcade" will return to Manhattan over the Santa Fe trail, arriving home August 27.

Forrester calls it the "Colorado White Tour." He began several weeks ago enlisting interest by a series of form letters, inviting White owners to participate. His letters were strongly and well worded, picturing the delights of Colorado and the joys to be found in the numerous camp-fire stops that will be made.

The pilot of the tour is Dr. Willhoit, of Manhattan, in a White 40 roadster. After touring Colorado 4 days and driving to Pueblo, the return trip will be made via La Junta and Lamar, the night stop being Garden City, Kan., a run of 231 miles. The next day's trip will include Dodge City, Great Bend and Lyons, ending at McPherson. August 27 the party will pass through Herrington and Junction City on the final run of 101 miles home.

Nearly every type of White gasoline car is represented. The first White sold in Kansas was entered by its Manhattan owner and is carrying a load of newspapermen. The vehicle has been running at least six years. To carry baggage and spare tires a White 1,500-pound delivery truck is accompanying the tourists. There is nothing to prevent a tourist's stopping at a hotel if he so desires, but the outdoor life has been made a feature of the run and roadside equipment is provided.

OAKLEY, KAN., Aug. 18—At the end of the first day all of the machines on the Colorado White Tour arrived in Hays, Kan., after a run of 184 miles from Manhattan on schedule and without any engine trouble whatever. There was a little tire trouble owing to the excessive heat in Kansas, but only a little time was taken out for the changes.

Seventeen White cars are in the tour at this time and a number will join before the tour reaches Denver. The roads in Kansas are ideal for touring. After passing Salina in the Golden Belt Route the roads are as hard as macadam, and recent rains have laid the dust.

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Tetzlaff's Benz Goes ½ Mile in 12 3/5 Seconds

NEW YORK CITY, Aug. 18—On August 12 Teddy Tetzlaff drove the Blitzen Benz one-half mile straight away on the salt beds west of Salt Lake City in 12 3-5 seconds. The test was made to determine the speed qualities of the course. The salt beds are about 40 miles long and 20 miles wide. The surface is water level and does not vary one-half inch in 10 miles. The beds are much harder than ice and dynamite is used to blow holes in order to sink the telephone and telegraph poles across it. It is possible to survey a circular track of any distance up to 30 miles, either in a perfect circle or an oval shape.

Tetzlaff's record is not official because it was not sanctioned by the A. A. A.

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Disbrow Lowers Mile and 2-Mile Track Records

NEW YORK CITY, Aug. 12—Louis Disbrow, in the Simplex Zip, on August 8 made a mile on a circular dirt track in St. Louis, Mo., in 45 1-5 seconds, one-fifth of a second below the world's record made by Oldfield at Bakersfield, Cal., April 27, 1913, in a Christie car. The 2-mile record on a dirt track, also made by Oldfield at Cleveland, O., on September 14, 1912, of 1:35 46-100, was also lowered by Disbrow, who negotiated the distance in 1:32 3-5.

These records have not as yet been accepted by the A. A. A., as the timing apparatus used at the meet has not been passed by the association. It will, however, test the apparatus at the coming Brighton Beach race on September 7. If it is passed by the contest board, these two records will stand as official.

Factory Miscellany

NEW Cyclecar Firm for Wilmington.—The Cycle Car Co., Wilmington, Del., a corporation chartered under the laws of Delaware, is now in active business and expects to have its product ready for delivery to agents soon. The firm manufactures a cyclecar. The firm was incorporated by Marvel, Marvel & Wolcott, and T. C. Bradford, a well-known automobilist of Wilmington, is the salesmanager. The machines are to be manufactured there, which will be a distributing center for several states around. A complete electric equipment will be provided, with electric lights flashing both strong and dim. The gears are three speeds forward and one reverse. The rate of fuel consumption is estimated at between 30 and 40 miles per gallon, and the speed ranges from 3 to 55 miles per hour. The gasoline tank will be located under the cowl dash, with a capacity of eight gallons. Wheels are the Houk wire type. The four-cylinder motor generates from 16 to 20 horsepower. The shops are located at 224 French street. Already many inquiries have been made regarding the machine, and even orders, some from foreign countries, placed. The industry bids fair to be a complete success, and the advantages offered by the city of Wilmington as a distributing center are many.

Breen Co. to Add—The Breen Motor Co., Winnipeg, Man., plans to build an addition to its plant at Broadway and Sherbrooke street.

Portland Co. to Add—The Fiske Rubber Co., Portland, Ore., will begin work shortly on the construction of a three-story factory at Tenth and Burnside streets.

American Co. Buys Land—The American Motor Co. bought a 90 by 240-foot lot at Clearfield and Seventeenth streets, Philadelphia, Pa. It is said that a plant will be erected on the site.

Factory for Mount Vernon—Plans for a factory building on Pearl street, Mount Vernon, N. Y., to cost $20,000, are being completed by the Benford Mfg. Co., maker of spark plugs.

Midgley Installing Machinery — The Midgley Tire & Rubber Co., Lancaster, O., is installing machinery in its plant, and will commence operating at an early date. It is reported that additional power plant equipment will be required later on.

Umpton Co. Expanding — Umpton Automobile Co., Bristol, Ind., automobile springs, is looking over the field in La Porte, Ind., with a view of expanding its business and will try to interest the people in the company's stock; it proposes to also manufacture a light five-passenger car.

Independent Tire Again Busy—The Independent Tire Co., Guelph, Ont., has been taken over by a new board of directors, including President Reiner, of Wellesley; Frank Campbell, of Mitchell, and Mr. Dunn, of Strathroy. They open again with fifty hands and hope to double that number shortly.

Selling Pope Plant's Machinery—Colonel George Pope, receiver of the Pope Manufacturing Co., is selling off the machinery in small lots. The sale of several parcels was authorized recently by the judges of the superior court. The factory is to close down August 20, when all operations will stop.

Southern Co. Purchases Land — The Southern Automobile Co. has bought 10 acres of land in St. Bernard parish, New Orleans, La., from A. P. Perrin and will start the erection of what is to be the first automobile manufacturing plant in the South. The plant is to be completed the latter part of November.

Stearns Will Add Two Plants—The F. B. Stearns Co., manufacturer of automobiles, is having plans prepared for the erection of two factories in East Cleveland, O. One will be four stories, 70 by 157 feet; the other a five-story, 70 by 155 feet reinforced-concrete structure. The estimated cost of the buildings is $20,000.

Pierce Speed Controller Increases—The Pierce Speed Controller Co., Anderson, Ind., recently greatly increased its working force, having received some large orders from several concerns connected with the automobile business. One of the largest orders received was for 6,000 governors from the Continental Motor Mfg. Co., Detroit.

Plans Company Reorganization—Plans are being made at Coshocton, O., for a reorganization of the S. & M. Tire & Rubber Co., of that city. It is expected that the interests in the company held by Canton and Akron men will be taken over by Coshocton capital. A new plant is being equipped for the company and operations are to be started there soon.

New Automobile Industry—Prather Bros., Georgetown, Ky., have bought a large dwelling house there and will convert it into a demountable wheel factory. The Prathers have recently invented and patented an automobile wheel. They have sold 200 of their wheels to an automobile factory in Cincinnati.

Grant Plant Inspected—Recently the Grant Motor Co. invited the business men of Findlay, O., to visit its plant. A large number responded to the invitation, and under the direction of officers of the automobile company a thorough inspection of the premises was made and the various stages in the construction of a motor car explained to the visitors.

Eureka Co. Moves—The Eureka Auto Parts Mfg. Co., St. Louis, Mo., has moved into larger quarters at 1915 Pine street. The company, which manufactures the Eureka Diamond Honeycomb radiators and special coolers for the U. S. government, for use on tractors in the Panama Canal zone, has recently placed on the market a new V-shaped radiator for Ford cars.

Woodward Pump Co. Organized—The Woodward Pump Co., Detroit, Mich., has been organized here. Abishal Woodward is president; Edward L. Ackerman, vice-president; Clarence E. Blaesser, treasurer; Chester T. Fezzy, assistant-treasurer and Cornelius B. Woodward, secretary. Temporarily the offices are at 222 Third street. Pending the erection of a plant, the Joseph N. Smith Co., 22 Porter street, will make the pumps which are known under the trade name of "Impulsive Tire Pump."

The Automobile Calendar

Aug. 21-22	Chicago, Ill,, Elgin Road Races, Chicago Automobile Club.
Aug.	Denver, Col., 650-mile Run, Colorado Springs to Salt Lake City.
Sept. 6-7-8	Newark, N. J., Cyclecar Reliability Tour to Atlantic City.
Sept. 7	Brighton Beach, N. Y., Track Meet, New York Motor Dealers' Contest Assn.
Sept. 7	Denver, Col., Track Race, Overland Park Track, Denver Motor Club.
Sept. 7-14	Indianapolis, Ind., Automobile Show, Indianapolis Automobile Trade Assn.
Sept. 9	Corona, Cal., Road Race, Corona Auto Assn.
Sept. 9-11	Convention Paving Brick Mfrs. Assn., Cleveland, O.
Sept. 10	Portsmouth, Eng., Autumn Conference, Institute of Metals.
Sept. 15-Oct. 11	New York City, Commercial Tercentenary Celebration.
Oct.	Philadelphia, Pa., E. V. A. A. Annual Convention.
Oct. 4	St. Louis, Mo., Automobile Show, Auto Manufacturers' and Dealers' Assn.
Oct. 7-17	New York City Electric Vehicle Show, Grand Central Palace.
Oct. 17-24	Pittsburgh, Pa., Automobile Show, Auto Dealers Assn., Inc.
Oct. 19, 20, 21	Philadelphia, Pa., Elec. Veh. Assn.'s Convention.
Oct. 19-26	Atlanta, Ga., American Road Congress of the American Highway Assn. and the A. A. A.
Oct. 28-31	Milwaukee, Wis., Convention, Northwestern Road Congress, Auditorium.
Nov.	El Paso, Tex., Phoenix Road Race, El Paso Auto Club.
Nov. 8-9	El Paso to Phoenix, Ariz., Automobile Race.
Nov. 8-11	Shreveport, La., Track Meet, Shreveport Auto Club.
Jan. 2-9	New York City, Annual Automobile Show, Grand Central Palace.
Jan. 3-10	Buenos-Aires, Argentina, Grand Prize of Argentina.
Jan. 9-16	Philadelphia Automobile Show.
Jan. 23-30	Chicago, Ill., Automobile Show, First Regiment Armory.

The Week in the Industry

Motor Men in New Roles

TWO New Russell Appointments—It has just been announced that J. A. Martin, for the past 4 years manager of the Vancouver branch of the Russell Motor Car Co., Toronto, Ont., has been appointed salesmanager for Canada. When the Vancouver branch was organized Mr. Martin was chosen for the work of introducing the Russell car on the Pacific coast. He has been especially successful in opening up new ground and prefers the more strenuous work of organizing new territory. J. R. Marlow has been appointed manager of the Montreal branch. Mr. Marlow has been salesmanager of the Russell company until recently. During the past month Mr. Marlow went to Montreal to take charge of the business there for a short time. Both appointments date from August 1.

Holmes, Alma Salesmanager—M. J. Holmes has been appointed salesmanager of the Alma Motor Truck Co., Alma, Mich., builder of the Republic trucks.

Van Horne Studebaker Manager—The commercial vehicle department of the Studebaker Corp., Detroit, Mich., is now under the management of Charles Van Horne.

Howard Hupp Assistant Manager — W. C. Howard, who has been a traveling salesman for the Hupp Motor Car Co., Detroit, Mich., has been appointed to the position of assistant sales manager.

Walton Heads Champion Co.—A. R. Walton, formerly with the St. Louis Car Co., St. Louis, Mo., is at the head of the Champion Motor Car Co., 5200 N. Second street, which is building a four-cylinder car costing $800.

Myers Quits Stutz Job—W. D. Myers, for the past 3 years salesmanager of the Stutz Motor Car Co., Indianapolis, Ind., has resigned his position. It is expected that he will enter the retail end of the motor car business.

Cohen Joins Marmon—J. Groves Cohen, formerly with U. S. Motors and Locomobile, has joined the sales department of Nordyke & Marmon Co., Indianapolis, Ind., and will travel the South in the interest of the Marmon.

Brown Makes Change—H. W. Brown, formerly district representative of the Lozier Motor Co., Detroit, and for 3 years salesmanager for Don Lee, San Francisco, has become a member of the Frank Roueche Co., of Salt Lake City, Utah.

Stephenson Joins McFarlan—R. E. Stephenson has been appointed district representative for the McFarlan car and will make his headquarters in Indianapolis, Ind. Mr. Stephenson has been in the retail automobile business in Muncie, Ind., for several years past.

Buck Goes to Hupp—Charles E. Buck, formerly with the advertising department of the Peninsular Engraving Co., and also Detroit representative of the J. Walter Thompson Co., has been appointed assistant advertising manager of the Hupp Motor Car Co., Detroit, Mich.

Curtis Crow District Manager—L. H. Curtis, of Crisfield, Md., has been appointed by the Crow Motor Car Co., as district manager of the Crow-Elk-Hart line in the Philadelphia territory. The company's plant at Elkhart, Ind., is busily engaged in turning out its new 1915 models.

Root Succeeds Ashley—H. G. Root, Springfield, O., has purchased the stock held by H. L. Ashley, secretary-treasurer and general manager of the Westcott Motor Car Co., Richmond, Ind., and succeeds him September 1. Mr. Root has been engaged for many years in the automobile supply business in this city.

Kelly Now Studebaker Distributor—H. E. Kelly, of Oklahoma City, Okla., who for the past 4 years has been state representative of the Studebaker Corp. in Oklahoma, has resigned his position and organized the Kelly Motor Co., which will open offices in that city for the distribution of the Studebaker cars.

Dixon Resigns — A. Dixon, for several years past salesmanager of the McFarlan Motor Co., Connersville, Ind., has resigned to accept the position of district manager for the Krit Motor Car Co, and will make his headquarters at Omaha, Neb. Mr. Dixon will have charge of a wide territory covering several states, for the Krit company.

Light, Dixon Detroit Head—Oliver Light has been appointed general manager of the offices which the Joseph Dixon Crucible Co., Jersey City, N. J., has opened in Detroit and which are temporarily with the Boyer-Cambell Co., Congress and Brush streets. The Detroit management will look after the interests of the New Jersey company in the states of Michigan, Indiana and Ohio.

Scheu Resigns from Euclid—E. A. Scheu, president and general manager of the Euclid Motor Car Co., New York City, has tendered his resignation and severed all connections with the company. He disposed of his stock holdings and will have no interest whatsoever in the future of the company. Mr. Scheu intends to take a short vacation, and has made no announcement regarding his future plans.

Boldman, Standard Salesmanager—E. D. Boldman, during the last 6 years identified with different commercial vehicle manufacturers as their distributor in the East, has been appointed salesmanager for the eastern district, consisting of the states of Massachusetts, Rhode Island and Connecticut, for the Standard Motor Truck Co., Detroit, which has decided to appoint other district managers in different sections of the country.

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Garage and Dealers' Field

Will Handle National—The Schreiber-Boorse Motor Car Co., Milwaukee, Wis., for the past 7 years distributor for the Locomobile, has closed a contract with the National Motor Vehicle Co., Indianapolis, Ind., to handle the National car in eastern Wisconsin.

Regal Added to Cartercar in Wisconsin—D. Wittenberg, owner of the Cartercar-Wisconsin Co., 2713 Grand avenue, Milwaukee, state agent for the Cartercar, has taken the agency for the Regal and to handle this department has organized a new corporation, the Regal Motor Co., with $5,000 capital.

Good Studebaker Sales Recorded — During the week ending June 20, R. L. Sutherland, Studebaker district representative for Indiana, reports that sixty-one Studebaker cars were sold out of Indianapolis, while during the following week the sales totaled close to sixty cars.

Reopell Buys Out Partner—A. V. Reopell has bought out his partner, W. L. Bunker, in what was formerly the Bunker & Reopell Co., Springfield, Mass., which had the agency for the Chevrolet cars. Mr. Reopell will continue the business. During the past season the former firm sold 54 Chevrolet cars in this city and vicinity.

Brown Tube's Winnipeg Office — The Brown Scientific Tube Co., the head office being at Longacre Building, Broadway, New York City, will open offices in Winnipeg at an early date. Senator Davis has control of the selling rights for Manitoba and Saskatchewan, and has appointed Mr. Murray as manager of the Winnipeg branch.

Ford Service in Madison, Wis.—A four-story Ford service building will be erected in Madison, Wis., state capital, by L. F. Schoelkopf, one of the first dealers in Madison and Ford agent for 7 years. Plans are being prepared for a fireproof building, 50 by 132 feet in size, four stories high, and when completed the Schoelkopf garage will be moved from 116 South Pinckney street to East Washington avenue.

Repairs Insisted Upon — The New Haven motorists have hit upon a good plan to insist on repairs being made in the city streets. Now when they see spots that are neglected, and which have been allowed to ravel away without any effort on the part of city officials to make repairs, the motorists get the local papers to take pictures and print stories showing the neglect, and this acts as a magical wand in changing conditions, for the officials do not relish public criticism backed up by photographic proofs.

New Reo Agents Appointed—The Capital Motor Car Co., Columbus, O., has been organized by Ira P. Madden and Ralph Atkinson, who are respectively president and general manager of the company, which has located at 168 North Fourth street, and which has the agency for the Reo cars for twelve counties, including Franklin county. The Reo Sales Co. and the Jeffery Distributing Co. have been organized in Salina, Kans., and Earl Hudkins is manager of both companies, which have the agency for the Reo and Jeffery cars.

Recent Incorporations in the Automobile Field

AUTOMOBILES AND PARTS

Canada

WINNIPEG—Canadian Bull Tractor Co.; capital, $1,000,000; to manufacture motor rucks. Incorporators: W. H. McWilliams, A. R. Argraft, J. S. Loudon, W. J. Cummings, Roy M. Wolbin, Walter Pace, L. A. Canon and H. P. Williams.

Illinois

CHICAGO—Service Motor Supply Co.; capital, $5,000; to deal in motor cars. Incorporators: Arthur J. J. Welsh, Gus. C. Aucutt, Samuel H. Silverman and H. F. Walbaum.

CHICAGO—North Side Buick Sales Co.; capital, $8,000; to deal in motor cars, accessories, etc. Incorporators: Henry Weil, Herman J. Rosenberg and Harry J. Lurie.

Indiana

ANDERSON—Simplex Sales Co.; capital, $12,000; to deal in motor cars. Incorporators: William H. Nelson, Eldred H. Wilford and Hattie A. Wheelock.

Iowa

WATERLOO—Dart Motor Truck Co.; under Delaware laws; capital, $600,000.

Kentucky

COVINGTON—Kenton Motors Co.; capital, $10,000. Incorporators: E. J. Rouse, L. E. Booth and M. R. Etheredge.

Louisiana

NEW ORLEANS—Eureka Water Motor Co.; capital, $10,000; to manufacture motors. Incorporators: J. B. Rochelle, E. J. Ernst and N. B. Ernst.

Missouri

LAWRENCEVILLE—Maxwell Motor Car Co.; capital, $200,000; to manufacture, buy, sell and repair motor cars. Incorporators: Andrew L. Maxwell, Casper L. Lewis and Noah M. Tehill.

New Jersey

PASSAIC—Passaic Auto Co.; capital, $1,000; to deal in motor cars. Incorporators: Chester R. Bates, M. K. Raymond and Chester L. Holloway, all of Passaic.

New Mexico

ROSWELL—Roswell Auto Co.; capital $50,000; general motor vehicle business. Incorporators: C. M. Farnsworth, C. C. Cagle and C. M. Sheperd, all of Roswell.

New York

DUNKIRK—Dunkirk Corporation; capital, $30,000; to manufacture mufflers, motors, engines, etc. Incorporators: E. Caldwell, E. K. Buttolph and R. J. Gross.

EDDYVILLE—Sanders Wilson Barnaby Co.; capital, $25,000; to deal in motor cars, etc. Incorporators: K. T. Barnaby, Newark, N. J., and others.

NEW YORK—Ventre & Ostruk; capital, $10,000; general motor car business. Incorporators, Henri Ventre, 250 West 54th street; Paul Ostruk, 1296 Avenue A; Joseph Schlesinger, 424 East 54th street.

YONKERS—Foster Motor Sales Co.; capital, $3,000. Incorporators: George B. Foster, Mary E. Foster and J. Bertram Foster, all of 84 Ludlow street.

Ohio

COLUMBUS—Capital Motor Car Co.; capital, $10,000; general motor vehicle business. Incorporators: Ira Madden, R. P. Atkinson and C. A. Yes.

Pennsylvania

PHILADELPHIA—Interstate Sales Co.; capital, $25,000; to manufacture and deal in motor cars, etc. Incorporators: W. C. Arnold, Lansdowne; H. G. Lansinger, Philadelphia; J. M. Satterfield, Dover.

Tennessee

NASHVILLE—Union Motor Co.; capital, $15,000; general motor vehicle business. Incorporators: E. Fisher Coles, Harding E. Jackson, R. C. Jones, Albert A. S. Britt and R. B. C. Howell.

Texas

HOUSTON—Emmert Machine & Auto Co.; capital, $5,000. Incorporators: Gus Emmert, Emil Emmert and C. G. Watson.

Wisconsin

MILWAUKEE—Regal Motor Co.; capital, $5,000; to deal in motor cars and accessories. Incorporators: D. Wittenberg, H. E. Legg and N. M. Wittenberg.

GARAGES AND ACCESSORIES

Connecticut

HARTFORD—Allen Bros. Garage; capital, $50,000.

California

SAN DIEGO—Owl Taxicab Co.; capital, $50,000. Incorporators: Herbert C. Guild, Horton L. Titus and E. L. Davin.

SAN FRANCISCO—Grand Pacific Garage Co.; capital, $20,000; to operate a garage. Incorporators: J. S. Adler, D. S. Cohn, J. J. Marx and H. Marx.

Delaware

DOVER—American Motor Utilities Co.; capital, $500,000; to manufacture Compton pneumatic starters and automatic control devices. Incorporators: J. McLaren, F. B. Knowlton and S. V. Dowling, all of New York City.

DOVER—International Motor Clubs Association; capital, $250,000; to furnish property protection to motorists. Incorporators: C. H. Butler, M. M. Hirons and L. B. Phillips, all of Dover.

Illinois

CHICAGO—United Electric Car Owners' Garages; capital, $50,000; to deal in motor cars, tires, etc., and operate garages. Incorporators: Sylvester C. Abbott, Dwight S. Bobb and E. P. Rumrill.

Indiana

EVANSVILLE—Benninghof-Nolan Co.; capital, $100,000; to deal in motor car supplies. Incorporators: Henry P. Benninghof, John J. Nolan and Val F. Nolan.

Kentucky

LOUISVILLE—Peerless Tire & Rubber Co.; capital, $10,000. Incorporators: A. F. Wolke, C. H. Wolke and Keith L. Bullitt.

Michigan

DETROIT—K.C.B. Co.; capital, $200,000; to manufacture a carbureter for heavy fuel. Incorporators: J. H. Chambers, C. H. Bennett and A. A. Leslie.

DETROIT—Michigan Lubricator Co.; capital, $200,000; to manufacture lubricators and other devices. Incorporators: John B. Corliss, John B. Corliss, Jr., and Cullen D. Corliss.

Missouri

ST. JOSEPH—National Spring Wheel Co.; capital, $100,000; to manufacture metal wheels for motor cars. Incorporators: W. L. Mann, W. P. Justice and E. J. Kearby.

North Carolina

WILMINGTON—Lassiter-McDuffie Co.; capital, $25,000. Incorporators: Clyde Lassiter, Neal O. McDuffie and Edwin T. Burton.

New Jersey

SOUTH ORANGE—Robinson Seitz Tire Co.; capital, $5,000; motor car tires. Incorporators: G. W. Robinson, A. M. Seitz and Frank Robinson, all of South Orange.

New York

BROOKLYN—Ellenbeck Tire & Supply Co.; capital, $5,000; to manufacture, deal in and repair tires, sundries, etc. Incorporators: William Ellenbeck, Jr., 44 Hancock street; Elmer H. Wilkinson and Elmer E. Wilkinson, both of 161 Underhill avenue.

ESOPUS—Kronenbergs & 77th Street Garage; capital, $1,000. Incorporators: Harris Weinstein, 92 Christie street, New York; Bertha Kronenberg and Bertha Kronenberg, both of 113 East 77th street, New York.

NEW ROCHELLE—C.B.A. Sales Co.; capital, $3,000; general garage business. Incorporators: Sidney H. Kent and William H. Schumacher, both of New Rochelle; M. J. Murphy, Brooklyn.

NEW YORK—Canada Carbide Sales Co.; capital, $10,000. Incorporators: Henry J. Fuller, Dongan Hills, S. I.; Douglas W. Dunn, Orange, N. J.; Walter L. Bush, West Brighton, N. Y.

NEW YORK—Pickens Auto Cloth Co.; capital, $1,000. Incorporators: Sale A. Pickens, 117 East 17th street; James W. Pickens, 5 West 65th street; Benjamin Simon, 17 East 101st street.

UTICA—Utica Garage Co.; capital, $1,500; to operate a garage. Incorporators: Paul Bartmer, 25 Plant street; Park T. Higgs, 1052 Elm street; Benjamin H. Dwinnel, Osborne avenue, New Hartford, N. Y.

Ohio

COLUMBUS—Ogden Fibre, Gear & Tire Co.; capital, $1,000; to manufacture and sell motor parts. Incorporators: D. Ogden, E. Ogden and Hubert S. Ogden.

Oklahoma

ENID—Oklahoma Auto Bus Co.; capitial, $1,000. Incorporators: F. J. Gentry, Pond Creek; C. E. Pendleton and L. G. Pendleton, both of Enid.

Wisconsin

MILWAUKEE—The L-Arrow Auto Livery Co.; capital, $10,000; to operate a taxicab and motor livery service. Incorporators: Charles H. Ewe, William F. Albers and Charles W. Modersohn.

Changes of Name and Capital

Indiana

INDIANAPOLIS—National Motor Vehicle Co., from $250,000 to $600,000.

Ohio

CINCINNATI—United States Motor Truck Co., from $25,000 to $300,000.

CLEVELAND—Winton Motor Carriage Co. to Winton Motor Car Co.

Kentucky

COVINGTON—United States Motor Truck Co., from $250,000 to $300,000.

Automobile Agencies Recently Established

PASSENGER CARS

Arizona

Phoenix	Metz	Cole Motor Co.

Arkansas

Pine Bluff	Studebaker	L. B. Bracken & C. H. Montague

California

Los Angeles	Premier	Smith Brothers
Oakland	Maxwell	The Peacock Motor Co

Canada

Calgary, Alta.	Haynes	H. T. Sheffield
Calgary, Alta.	Maxwell	Thos. E. Jackson
Edmonton, Alta.	Baby Rex	Rex Motors of Canada, Ltd.
Edmonton, Alta.	Paige-Detr.	Dominion Motors, Ltd.
Medicine Hat, Alta.	Franklin	Diehl Motor Car Co.
Victoria, B. C.	Lozier	J. Cameron
Gananoque, Ont.	Maxwell	W. G. Gibson
Hamilton, Ont.	Cole	The Patterson Auto Sales Co.
Hamilton, Ont.	Haynes	Jack C. Elliott
London, Ont.	Chandler	The Central Garage
Niagara Falls, Ont.	Marathon	Crane Bros.
Ottawa, Ont.	Brockville Atlas	Hull & Ottawa Garage Co.
Paris, Ont.	Saxon	A. C. Lee
Sarnia, Ont.	Franklin	Hitchcock & Richardson
Toronto, Ont.	Chandler	Brintnell Motors, Ltd.
Toronto, Ont.	Napier	The British Canadian Import Co.
Magog, Que.	Maxwell	W. T. Peters
Estevan, Sask.	Maxwell	Frederichson & Green
Moose Jaw, Sask.	Maxwell	Henry B. Annabel

Colorado

Denver	Chalmers	Western Motor Car Co.

District of Columbia

Washington	Metz	Cartercar Sales Co.
Washington	Mitchell	Mitchell Sales Co.
Washington	Reo	Smith-Trew Motor Co.

Florida

Gainesville	Cole	Gainesville Motor Car Co.
Tampa	Cole	West Coast Automobile Co.

Illinois

Centralia	Cole	Centralia Garage & Vulcanizing Co.
Joliet	Cole	H. B. Sahler

Indiana

Bloomington	Cole	College Avenue Garage
Evansville	Ford	Korb & Co.
Ft. Wayne	Cole	Ft. Wayne Iron Store Co
Hillsboro	Cole	Byron Heesler
Huntington	Cole	John E. Miller
Kokomo	Cole	C. F. Seaward & Son
Martinsville	Cole	Martinsville Auto Co
Michigan City	Cole	W. J. Grieger
Needham	Cole	L. M. Megee

Iowa

Council Bluffs	Cole	C. H. Robertson
Eldora	Cole	Emeny Auto Co.
Iowa City	Cole	H. A. Knease & Sons
Muscatine	Cole	Danham & Smalley Motor Co.
Ottumwa	Cole	Johnson Motor Car Co.

Kansas

Chanute	Cole	E. W. Weiner
Halls Summit	Cole	H. W. McFadden, Jr.
Iola	Cole	J. G. Mittelback
Ottawa	Cole	Troup Brothers
Sabetha	Cole	Mishler Bros.
Strong City	Cole	Dr. J. Hinden
Topeka	Cole	George R. Evans
Yates City	Cole	Stoll Bros.

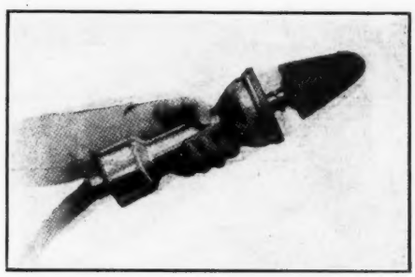

Fig. 5—Wizard car washer with a revolving brush propelled by the outflowing water

STEWART Hand Operated Horn—Five dollars is the price of a new hand operated horn, Fig. 1, just announced by the Stewart-Warner Speedometer Corp., Chicago, Ill.

The feature is the special double bracket for attaching it to the car. This supports the horn both in the middle and also at the rear end, so that any pressure on the sounding plunger is distributed between these two points, and therefore no looseness can develop.

This bracket, instead of being fastened directly to the car is mounted on an additional bracket, which is attached to the top rail of the car and conforms to the direction and design of the top rail. The two brackets are fastened by a swivel joint and thus can be turned in any direction desired.

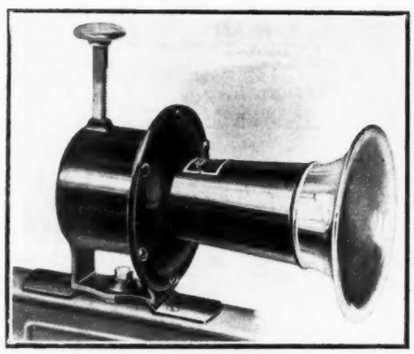

Fig. 1—New Stewart hand-operated horn

Comfort Shock Absorbers—Front and rear shock absorbers for Ford cars are manufactured by the Comfort Shock Absorber Co., Hempstead, L. I. One of these is illustrated in Fig. 2. It will be noted that the device is designed for attachment to the spring ends and that two springs concentrically placed are employed in each unit. The advantage of this is that a better action is secured. Ordinarily the inner spring supports the load, but when the load increases the second spring comes into action.

A 30-days' free trial is offered and the guarantee is for life. The price per pair is $7.00 and four list at $12.50.

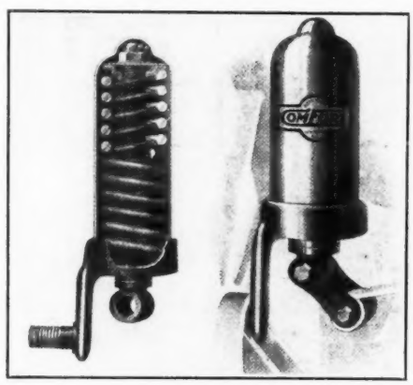

Fig. 2—Comfort shock absorbers for Fords

Tite-Wad Self-Locking Nut—The Empire Automatic Equipment Co., Syracuse, N. Y., is manufacturing the locknut illustrated in Fig. 3.

It is made in two parts only, the inner and outer sleeve, and by the peculiar spiral joint between these two members there is a cam-like action, the outer sleeve turning on the inner one, and locking the nut to the threads by friction.

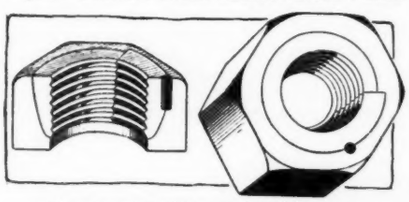

Fig. 3—Tite-Wad self-locking nut

National Standard Jacks—The Standard line of jacks, Fig. 4, manufactured by The National Standard Co., Niles, Mich., comprises all types. They are made for several lifting capacities and purposes, and lift either by ratchet mechanism or by screw arrangement. The latest type to be placed on the market by the Niles concern is the Standard tire saver and garage jack which is made primarily for quick action, and is preferably sold in sets of four so that the car may be completely lifted from the floor at its four corners, thus prolonging the life of the tires when the car is to stand for any length of time. Oily floors are in this way relieved of their menace.

The new National jack is made of malleable castings and the foot of the frame is of generous proportions to give needed support against tipping over. The lifting bar is enclosed and cannot fall apart when moved. Another point is that the teeth are placed close together, permitting of a wide range of action. The top of the lifting bar is swiveled, allowing for its being turned to any desired position. The jack may be readily adjusted to fit any size wheel from 30 to 42 inches in diameter.

The price for a set of four is $5.50.

The other jacks of Standard make range in lifting capacity from 1,500 to 2,000 pounds, and are thus adaptable to any car. One very good model, for instance, is the No. 1 Standard which is a 1-ton jack of the enclosed ratchet type and which has a height, with bar down, of 11 1-2 inches. With the lifting bar raised, this dimension is 18 inches. It weighs 9 1-2 pounds and lists at $4. This is suitable for the heaviest cars. The Baby Standard at $3 lifts 1,500 pounds, weighs 6 1-2 pounds and has a height with the bar down of 10 1-2 inches. Then there are several other styles.

For use with Fords or other light cars, a screw-type jack has been added to the line. This device, selling at $1, weighs 4 pounds and has a 6-inch lift.

The National company also makes a metal handle for jacks where it is necessary to lift large, heavy cars. These serve a double purpose, as they have a tire removing tool on one end. The length of these handles is regularly 15 inches, but for use with cars having a considerable overhang at the rear axle, they may be had 18 inches in length.

Wizard Car Washer—An improvement over the ordinary method of sponging cars in washing is claimed by the Century Foundry Co., Syracuse, N. Y., who has brought out a washer consisting of a combined nozzle and brush, Fig. 5. There are two brushes, both closely and smoothly shaved, one round like a sponge for use on flat surfaces, the other pointed for corners.

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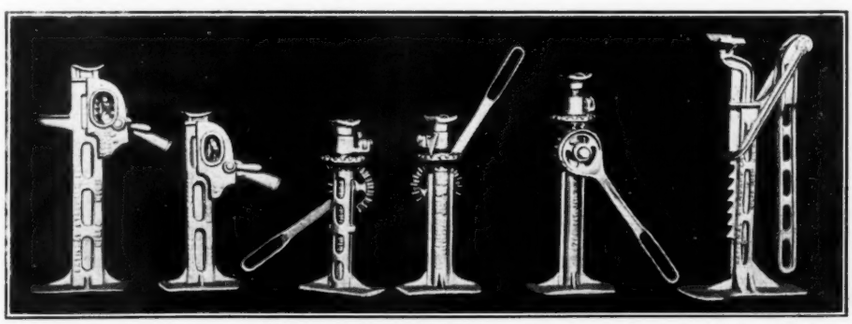

Fig. 4—National standard jacks of various types. The one at the extreme left is sold in sets of four and is to be used for saving the tires when the car is standing

Recent Incorporations in the Automobile Field

AUTOMOBILES AND PARTS

Canada

WINNIPEG—Canadian Bull Tractor Co.; capital, $1,000,000; to manufacture motor rucks. Incorporators: W. H. McWilliams, A. R. Argraft, J. S. Loudon, W. J. Cummings, Roy M. Wolbin, Walter Pace, L. A. Canon and H. P. Williams.

Illinois

CHICAGO—Service Motor Supply Co.; capital, $5,000; to deal in motor cars. Incorporators: Arthur J. J. Welsh, Gus. C. Aucutt, Samuel H. Silverman and H. F. Walbaum.

CHICAGO—North Side Buick Sales Co.; capital, $8,000; to deal in motor cars, accessories, etc. Incorporators: Henry Weil, Herman J. Rosenberg and Harry J. Lurie.

Indiana

ANDERSON—Simplex Sales Co.; capital, $12,000; to deal in motor cars. Incorporators: William H. Nelson, Eldred H. Wilford and Hattie A. Wheelock.

Iowa

WATERLOO—Dart Motor Truck Co.; under Delaware laws; capital, $600,000.

Kentucky

COVINGTON—Kenton Motors Co.; capital, $10,000. Incorporators: E. J. Rouse, L. E. Booth and M. R. Etheredge.

Louisiana

NEW ORLEANS—Eureka Water Motor Co.; capital, $10,000; to manufacture motors. Incorporators: J. B. Rochelle, E. J. Ernst and N. B. Ernst.

Missouri

LAWRENCEVILLE—Maxwell Motor Car Co.; capital, $200,000; to manufacture, buy, sell and repair motor cars. Incorporators: Andrew L. Maxwell, Casper L. Lewis and Noah M. Tehill.

New Jersey

PASSAIC—Passaic Auto Co.; capital, $1,000; to deal in motor cars. Incorporators: Chester R. Bates, M. K. Raymond and Chester L. Holloway, all of Passaic.

New Mexico

ROSWELL—Roswell Auto Co.; capital $50,000; general motor vehicle business. Incorporators: C. M. Farnsworth, C. C. Cagle and C. M. Sheperd, all of Roswell.

New York

DUNKIRK—Dunkirk Corporation; capital, $30,000; to manufacture mufflers, motors, engines, etc. Incorporators: E. Caldwell, E. K. Buttolph and R. J. Gross.

EDDYVILLE—Sanders Wilson Barnaby Co.; capital, $25,000; to deal in motor cars, etc. Incorporators: K. T. Barnaby, Newark, N. J., and others.

NEW YORK—Ventre & Ostruk; capital, $10,000; general motor car business. Incorporators, Henri Ventre, 250 West 54th street; Paul Ostruk, 1296 Avenue A; Joseph Schlesinger, 424 East 54th street.

YONKERS—Foster Motor Sales Co.; capital, $3,000. Incorporators: George B. Foster, Mary E. Foster and J. Bertram Foster, all of 84 Ludlow street.

Ohio

COLUMBUS—Capitnl Motor Car Co.; capital, $10,000; general motor vehicle business. Incorporators: Ira Madden, R. P. Atkinson and C. A. Yes.

Pennsylvania

PHILADELPHIA—Interstate Sales Co.; capital, $25,000; to manufacture and deal in motor cars, etc. Incorporators: W. C. Arnold, Lansdowne; H. G. Lansinger, Philadelphia; J. M. Satterfield, Dover.

Tennessee

NASHVILLE—Union Motor Co.; capital, $15,000; general motor vehicle business. Incorporators: E. Fisher Coles, Harding E. Jackson, R. C. Jones, Albert A. S. Britt and R. B. C. Howell.

Texas

HOUSTON—Emmert Machine & Auto Co.; capital, $5,000. Incorporators: Gus Emmert, Emil Emmert and C. G. Watson.

Wisconsin

MILWAUKEE—Regal Motor Co.; capital, $5,000; to deal in motor cars and accessories. Incorporators: D. Wittenberg, H. E. Legg and N. M. Wittenberg.

GARAGES AND ACCESSORIES

Connecticut

HARTFORD—Allen Bros. Garage; capital, $50,000.

California

SAN DIEGO—Owl Taxicab Co.; capital, $50,000. Incorporators: Herbert C. Guild, Horton L. Titus and E. L. Davin.

SAN FRANCISCO—Grand Pacific Garage Co.; capital, $20,000; to operate a garage. Incorporators: J. S. Adler, D. S. Cohn, J. J. Marx and H. Marx.

Delaware

DOVER—American Motor Utilities Co.; capital, $500,000; to manufacture Compton pneumatic starters and automatic control devices. Incorporators: J. McLaren, F. B. Knowlton and S. V. Dowling, all of New York City.

DOVER—International Motor Clubs Association; capital, $250,000; to furnish property protection to motorists. Incorporators: C. H. Butler, M. M. Hirons and L. B. Phillips, all of Dover.

Illinois

CHICAGO—United Electric Car Owners' Garages; capital, $50,000; to deal in motor cars, tires, etc., and operate garages. Incorporators: Sylvester C. Abbott, Dwight S. Bobb and E. P. Rumrill.

Indiana

EVANSVILLE—Benninghof-Nolan Co.; capital, $100,000; to deal in motor car supplies. Incorporators: Henry P. Benninghof, John J. Nolan and Val F. Nolan.

Kentucky

LOUISVILLE—Peerless Tire & Rubber Co.; capital, $10,000. Incorporators: A. F. Wolke, C. H. Wolke and Keith L. Bullitt.

Michigan

DETROIT—K.C.B. Co.; capital, $200,000; to manufacture a carbureter for heavy fuel. Incorporators: J. H. Chambers, C. H. Bennett and A. A. Leslie.

DETROIT—Michigan Lubricator Co.; capital, $200,000; to manufacture lubricators and other devices. Incorporators: John B. Corliss, John B. Corliss, Jr., and Cullen D. Corliss.

Missouri

ST. JOSEPH—National Spring Wheel Co.; capital, $100,000; to manufacture metal wheels for motor cars. Incorporators: W. L. Mann, W. P. Justice and E. J. Kearby.

North Carolina

WILMINGTON—Lassiter-McDuffie Co.; capital, $25,000. Incorporators: Clyde Lassiter, Neal O. McDuffie and Edwin T. Burton.

New Jersey

SOUTH ORANGE—Robinson Seitz Tire Co.; capital, $5,000; motor car tires. Incorporators: G. W. Robinson, A. M. Seitz and Frank Robinson, all of South Orange.

New York

BROOKLYN—Ellenbeck Tire & Supply Co.; capital, $5,000; to manufacture, deal in and repair tires, sundries, etc. Incorporators: William Ellenbeck, Jr., 44 Hancock street; Elmer H. Wilkinson and Elmer E. Wilkinson, both of 161 Underhill avenue.

ESOPUS—Kronenbergs & 77th Street Garage; capital, $1,000. Incorporators: Harris Weinstein, 92 Christie street, New York; Bertha Kronenberg and Bertha Kronenberg, both of 113 East 77th street, New York.

NEW ROCHELLE—C.B.A. Sales Co.; capital, $3,000; general garage business. Incorporators: Sidney H. Kent and William H. Schumacher, both of New Rochelle; M. J. Murphy, Brooklyn.

NEW YORK—Canada Carbide Sales Co.; capital, $10,000. Incorporators: Henry J. Fuller, Dongan Hills, S. I.; Douglas W. Dunn, Orange, N. J.; Walter L. Bush, West Brighton, N. Y.

NEW YORK—Pickens Auto Cloth Co.; capital, $1,000. Incorporators: Sale A. Pickens, 117 East 17th street; James W. Pickens, 5 West 65th street; Benjamin Simon, 17 East 101st street.

UTICA—Utica Garage Co.; capital, $1,500; to operate a garage. Incorporators: Paul Bartmer, 25 Plant street; Park T. Higgs, 1052 Elm street; Benjamin H. Dwinnel, Osborne avenue, New Hartford, N. Y.

Ohio

COLUMBUS—Ogden Fibre, Gear & Tire Co.; capital, $1,000; to manufacture and sell motor parts. Incorporators: D. Ogden, E. Ogden and Hubert S. Ogden.

Oklahoma

ENID—Oklahoma Auto Bus Co.; capitial, $1,000. Incorporators: F. J. Gentry, Pond Creek; C. E. Pendleton and L. G. Pendleton, both of Enid.

Wisconsin

MILWAUKEE—The L-Arrow Auto Livery Co.; capital, $10,000; to operate a taxicab and motor livery service. Incorporators: Charles H. Ewe, William F. Albers and Charles W. Modersohn.

Changes of Name and Capital

Indiana

INDIANAPOLIS—National Motor Vehicle Co., from $250,000 to $600,000.

Ohio

CINCINNATI—United States Motor Truck Co., from $25,000 to $300,000.

CLEVELAND—Winton Motor Carriage Co. to Winton Motor Car Co.

Kentucky

COVINGTON—United States Motor Truck Co., from $250,000 to $300,000.

Automobile Agencies Recently Established

PASSENGER CARS

Arizona

Phoenix	Metz	Cole Motor Co.	

Arkansas

Pine Bluff	Studebaker	L. B. Bracken & C. H. Montague	

California

Los Angeles	Premier	Smith Brothers	
Oakland	Maxwell	The Peacock Motor Co	

Canada

Calgary, Alta	Haynes	H. T. Sheffield	
Calgary, Alta	Maxwell	Thos. E. Jackson	
Edmonton, Alta	Baby Rex	Rex Motors of Canada, Ltd.	
Edmonton, Alta	Paige-Detr	Dominion Motors, Ltd.	
Medicine Hat, Alta	Franklin	Diehl Motor Car Co.	
Victoria, B. C	Lozier	J. Cameron	
Gananoque, Ont	Maxwell	W. G. Gibson	
Hamilton, Ont	Cole	The Patterson Auto Sales Co.	
Hamilton, Ont	Haynes	Jack C. Elliott	
London, Ont	Chandler	The Central Garage	
Niagara Falls, Ont	Marathon	Crane Bros.	
Ottawa, Ont	Brockville Atlas	Hull & Ottawa Garage Co.	
Paris, Ont	Saxon	A. C. Lee	
Sarnia, Ont	Franklin	Hitchcock & Richardson	
Toronto, Ont	Chandler	Brintnell Motors, Ltd.	
Toronto, Ont	Napier	The British Canadian Import Co.	
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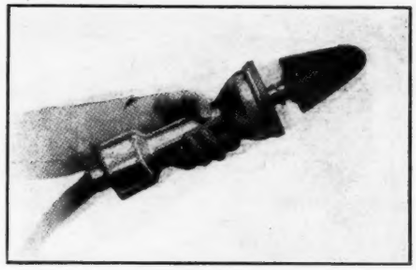
Accessories for the Automobilist



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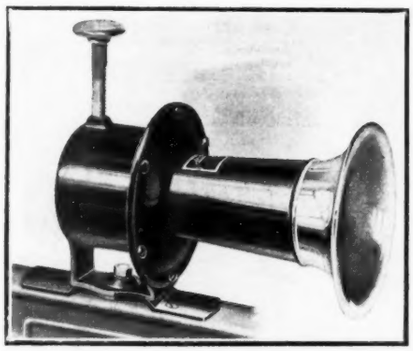

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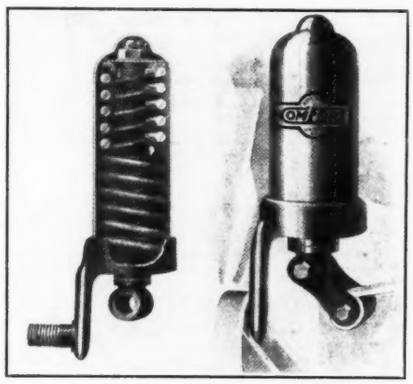

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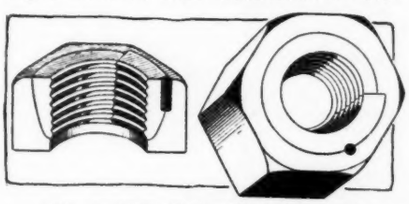

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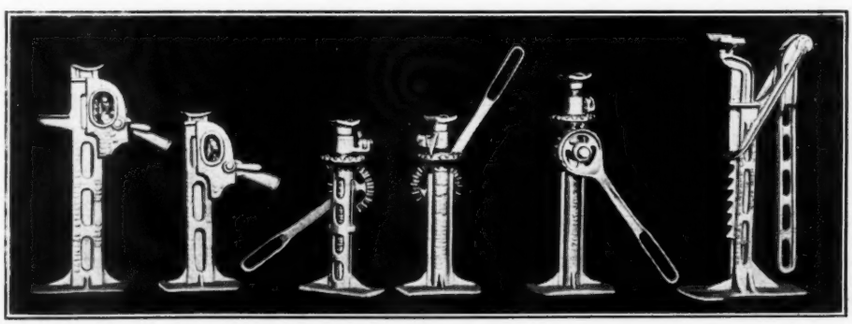

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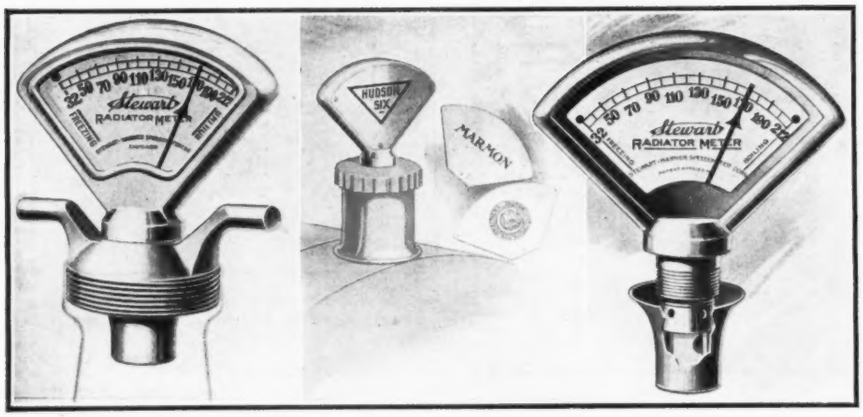

Fig. 6—Stewart radiator meters showing method of attaching the nameplate of the car to the back of the device. At the left is the combined radiator cap and meter for Fords

the most highly polished vehicle and yet it is claimed that no injury to the varnish is done for the reason that the brush runs inside a film of water which is thrown from the exhaust of the motor that propels the brush.

Stewart Radiator Meter—The special thermometer, Fig. 6, brought out for registering radiator temperatures a few months ago has recently been improved by adding a replica of the name-plate of the car to the reverse side. In addition a combined radiator meter and filler cap is now manufactured for Ford cars.

It is manufactured by the Stewart-Warner Speedometer Corp., Chicago, Ill.

Shanhouse Motorsuit—Many motor car owners will appreciate the garage suit made by W. Shanhouse & Sons, Rockford, Ill., and retailing at $2. This suit is similar to those used by racing car drivers while they are working about their cars. The suit is made of strong tan-colored material and covers the entire body.

Bryant Gearshift Lock—Fig. 7 shows a lock designed to prevent the theft of the car by locking the change gear lever in place. It consists of a pair of forks that slip down into the shifting slots and thus prevent the lever from being moved from neutral. The upper part of the mechanism, which contains the lock is clamped to the change lever and the lower part which carries the fork telescopes into it.

The clip which holds the upper half in place is bolted from the inside before the parts are telescoped together. The body is locked to the lever by a small ridge across the back wall of the body, which beds into a 1-8 groove, filed across the lever and the two parts are locked together by brass pins which are driven in and cannot be removed except by drilling. The locking of the car is the work of a moment. Simply kick or push down the stem and the forks of the lower end are forced into the gate on each side of the lever, and hold it rigidly in neutral until the proper Yale key is inserted.

It is made by the Bryant Sales Co., 422 Cuyahoga Bldg., Cleveland, O., and sells for $3.

Westinghouse Portable Meters—A new line of 5-inch diameter, direct-current portable ammeters, voltmeters, and millivolt meters, known as the type PW, has just made its appearance and are shown in Fig. 8.

These instruments are direct reading and suitable for battery testing, signal

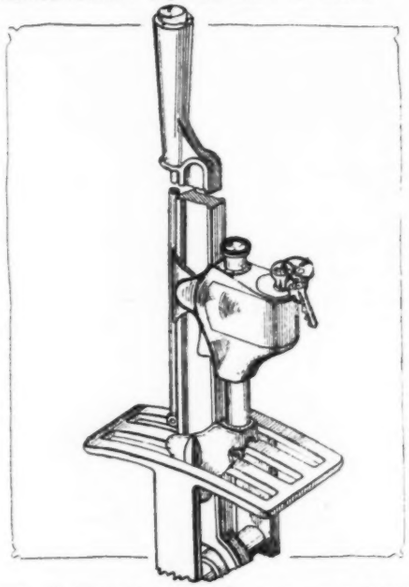

Fig. 7—Bryant gearshift lock to prevent theft of the car

work, and all purposes where an instrument of pocket size is desirable. They are particularly adapted to testing electric lighting and starting equipments of automobiles. They operate on the D'Arsonval principle, having a moving coil and a permanent magnet, which renders them free from residual errors.

The complete movement is mounted as a unit. A unique feature is the arrangement of the moving element which can be readily removed by taking off the cover and removing the two screws on the side pole-piece support. The entire moving element and the bearings can then be lifted out as a unit and can be replaced in exact position. This makes repairing possible without disturbing the alignment of the magnetic circuit.

Owing to the use of an aluminum pointer, a light counter-weight is sufficient, resulting in a light-weight movement and small wear on the pivot jewels. Their high torque in proportion to their light weight moving element insures great accuracy, considering their size. The meter will withstand shocks, such as it will be subjected to in ordinary use, without affecting the accuracy.

The light metal frame on which the moving coil is wound moves through the air-gap of the strong magnet and makes the reading inherently dead-beat. This very important feature enables readings to be taken quickly, and prevents violent fluctuations from injuring the pointer or the moving element.

The scale is made of metal and subtends an arc of 90 degrees, giving large open divisions which are uniform throughout.

The full length of the pointer shows on the dial, thus making the meter easy to read. Each meter is mounted in a morocco leather-covered wood case with the heavy bevelled glass over dials.

A new feature has been used on the meter terminals. The terminal stud has a V-shaped groove (see Figs. 3 and 4) into which the wire lead is inserted. The thumb nut then screws down on the lead, gripping it in close contact between the thumb nut and the two sides of the groove. This feature has not heretofore been used on meters of American make, it is stated.

These meters are manufactured by the Westinghouse Electric & Manufacturing Company.

Ford Sedan Body—A closed body, Fig. 9 of the sedan type is manufactured by the Storm Buggy Co., 129 East Center street, Fostoria, O., for Ford automobiles. It is designed to carry four or five people comfortably. Wide window spaces are a feature. The windows may be raised or lowered at will in the doors and back, and the front opens for ventilation and rain vision. It is stated that the body is cool in summer, due to the provision for ventilation, and yet is warm in winter and dry in rainy weather. The upholstering is deep, and is made of whipcord, curled hair and comfortable pillow springs. The rear and side windows are fitted with silk curtains.

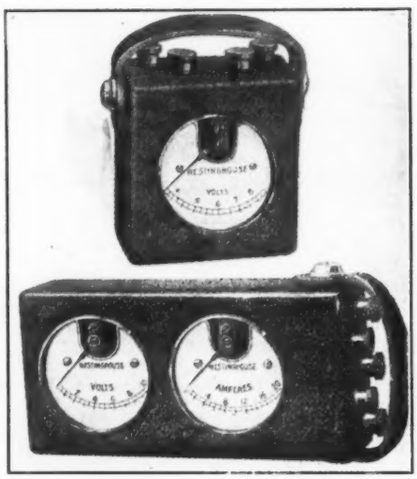

Fig. 8—Westinghouse portable meters. Top shows the voltmeter, while below is a combination of the volt and ammeter

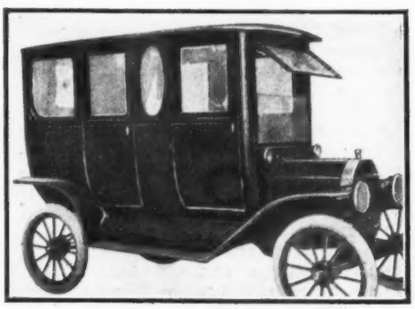

Fig. 9—Ford sedan body